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Electrical World

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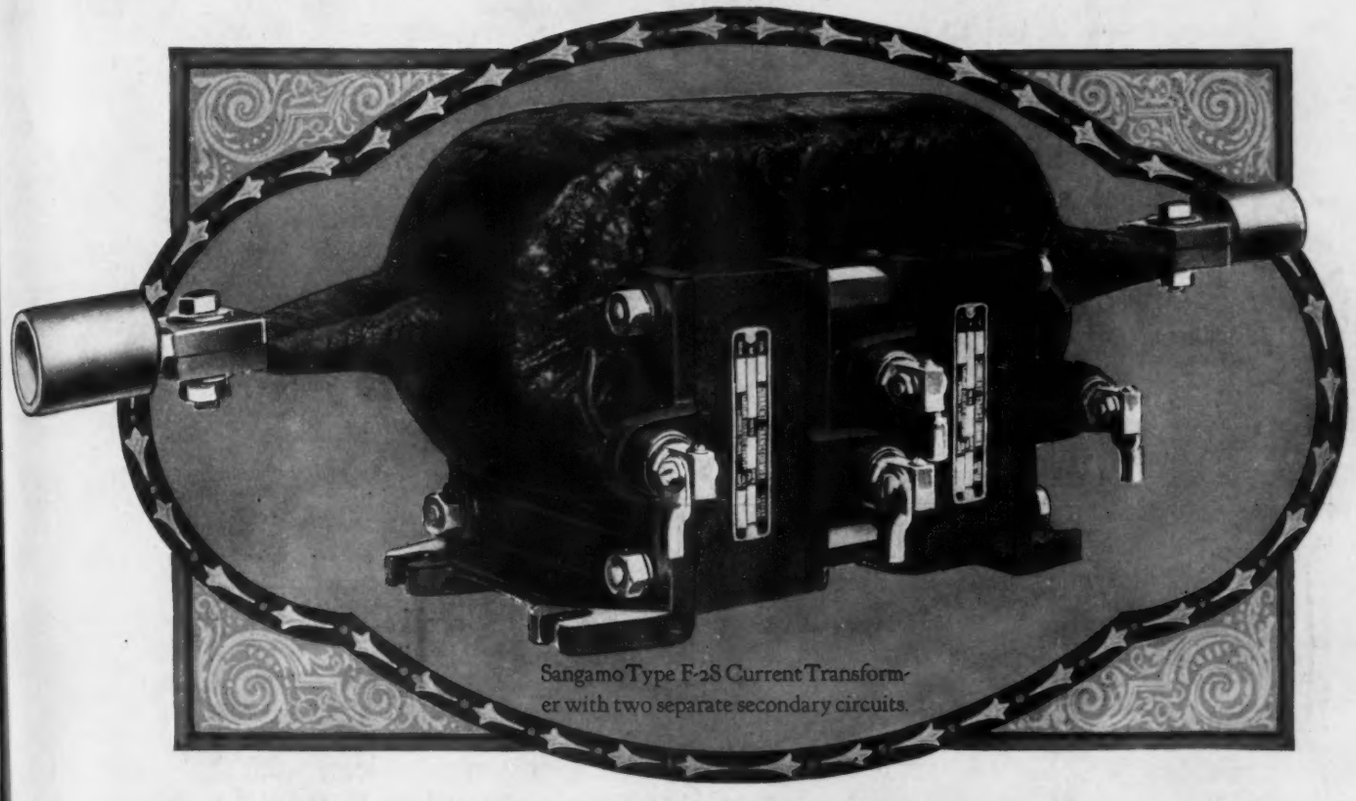

Sangamo Type F-2S Current Transformer with two separate secondary circuits.

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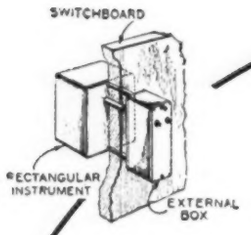
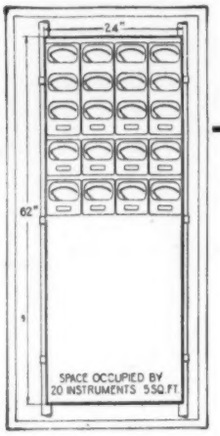


Layout of Rear—External Boxes, where required, occupy less space than the instruments.



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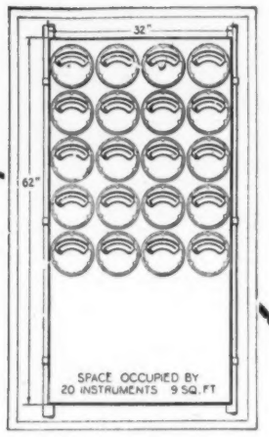
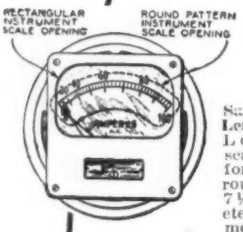
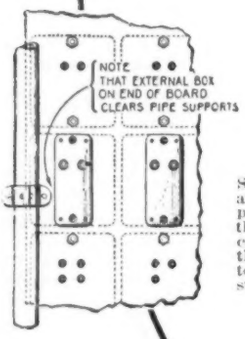


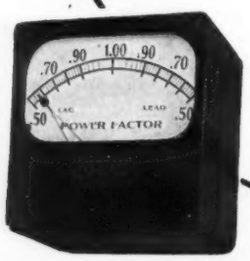
A striking space comparison favoring Weston Rectangular Instruments



Same Scale Length — The Length of scale is equal for both the round pattern, 7½ in. diameter instrument and these new rectangular types.



Studs—All studs are arranged approximately on the approximate center axis of the instruments to clear pipe supports.



These comparative layouts demonstrate the great space saving made possible by Weston rectangular instruments.

Here, for example, are typical layouts of the same four circuit panel showing the space occupied by an equal number of instruments of both types. These layouts are based on recent practice in connection with four circuit panels.

The round pattern instrument (at right) with a diameter of 7¾ inches, requires 9 square feet of space as compared to 5 square feet occupied by the rectangular type (at left) with dimensions of 5¾ x 6 inches. The round pattern type requires a panel one-third again as wide as the rectangular type, with a corresponding increase in height.

The new complete group of Weston instruments consists of Alternating Current Ammeters, Voltmeters, Wattmeters, Frequency Meters, Power Factor Meters and Triplex Ammeters; and Direct Current Voltmeters and Ammeters.

It will pay all engineers and switchboard designers to investigate the new Weston instruments. On request a representative will be glad to make a special visit to discuss any question that may arise. Here is a real opportunity for better and less expensive switchboards.

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The consolidation of Electrical World, Electrical Engineer and American Electrician

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W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

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Duties Versus Rights in the Highway

FOR many years it was the universal habit to speak of electric power induction in a telephone line as inductive interference, using the term rather loosely to include all audible induction whether severe enough to establish interference or not. The very name of the phenomenon suggested an injured party, and by implication it followed, of course, that somehow there was an unwarranted emanation of electrical energy which ought to be mitigated. This attitude of mind instantly identified the aggrieved and the aggressor and fostered the controversial spirit. Such a state of affairs persisted until forward-thinking utility managers perceived that there is obvious psychological advantage in the use of correct and desirable terminology.

Fortunately the occurrence of inductive interference is not common, even temporarily, but audible electric power induction of feeble and harmless degree is perhaps more often observed than not, especially if the listener is somewhat expert at detecting it. The remedies for interference, as well as the common means for lessening the audibility of inductive telephonic noise, are collectively termed "inductive co-ordination." Since the occasions for adopting or installing any of the means in the art for controlling audible induction, as distinguished from interference, are daily multiplying with striking rapidity, there is obvious advantage in using this lately coined name rather than the old term. Immediately there is a new point of view. The mere name of the remedy, "co-ordination," inherently suggests mutuality and co-operation. Mutual discussion of duties and privileges now takes the place of former controversy over supposed rights and obligations. The spirit of give and take, or live and let live, happily displaces the belligerency of "thou must" and "we will."

One of the clearest impartial statements ever delivered on the mutual rights and duties of utilities on the highways was that made by Judge David F. Simpson of Minneapolis before the N. E. L. A. convention at Atlantic City, which was given almost in full in the May 24 issue of the ELECTRICAL WORLD, page 1091. This discussion of the problem is both lucid and timely. Judge Simpson's observations are not those merely of a skillful advocate, but of an experienced and eminent jurist who has had exceptional training in protection of the public interest. It has sometimes been remarked that the best engineering solution of any inductive co-ordination problem can be correctly approached by assuming that both the electric communication system and the electric supply system are for the moment owned by the same interests. Such a viewpoint tends to subordinate merely selfish motives and inspires a broader conception. This is virtually what Judge Simpson has done in his presentation of the public interest in the correct solution of co-ordination difficulties on the highway. He shows that the public interest is a paramount consideration and from this premise develops a philosophy of mutual rights and duties founded on adequate and efficient service to the public by each utility concerned. Service is a continuing matter; the instrumentalities for supplying it require change and readjustment from time to time in order to meet changing conditions or to keep abreast of progress, but the service goes on as before and becomes progressively more essential to human welfare. As new kinds of service are wanted by the public the existing utilities must reasonably adapt themselves to the new conditions, so that the public needs may be supplied at all times in the most expeditious and equitable manner. Such is the law of progress.

Another Advance Toward a Single Rating for General-Purpose Motors

THE Electric Power Club has taken all but the final step to adopt a simple single rating for general-purpose motors—the rating of which has been the basis of commercial warfare and debate, sometimes more acrimonious than friendly, for seven or eight years. A year ago the Power Club dropped the 40-degree-55-degree rating and the 50-degree rating as adopted standards and in their stead adopted as a "recommended practice" the single 40-degree rating: "An open-type general-purpose motor shall be capable of carrying full rated load continuously with a temperature rise not exceeding 40 degrees C." This, however, was modified by a footnote relating to overload capacities. At its meeting last week the club performed the much-desired operation of cutting off this footnote, leaving a simple significant rating. This now represents the Power Club's sole mention of this rating subject. That this will soon be made its "adopted standard" is to be expected and hoped. American manufacturers will then be able to present a definite single program on this subject in international deliberations and not be compelled to sit by as onlookers, quibbling among themselves and unable to take an active part in the proceedings, while men of other nations formulate international standards and rules.

The situation has been somewhat complicated from another quarter, however, by the proposal from the N. E. L. A. to mark a supplementary rating on the nameplate to represent the capacity of the machine at 25 degrees ambient temperature, the main rating being based on 40 degrees ambient temperature. The central stations, of course, see the problem with its complication of rate schedules when they are based on connected load and are also fearful regarding overmotoring, poor power factor, etc. But the manufacturers who have been through the agony of trying to make 10 hp. mean two things do not take kindly to labeling a given motor

both 10 hp. and 12½ hp. They have seen the folly of trying to use ratings to take the place of application engineering or of specifying unusual service conditions.

It has often been pointed out that a rating should specify some agreed-upon definite limitation. Essentially it makes little difference what that limitation is so long as it is understood and universally used. Whatever detail may develop in the present discussion, it is to be hoped that a single definite rating will result. The action of the manufacturers in the Power Club is a commendable step in this direction.

Fruitful Research on Turbine Wheels

A SPLENDID research paper was presented at the recent Cleveland meeting of the American Society of Mechanical Engineers. It involved the detailed analysis of every stress and vibration that occurs in turbine-disk wheels under all conditions of temperature and pressure. Wilfred Campbell, who presented it, showed how the problem was solved to its last detail and how quantitative results were obtained that can be applied to all similar applications in all industry. Laborious studies, experimentation with many materials and the application of many sciences, combined with research genius and indomitable persistence, wrested new knowledge for the use of all mankind. In a public meeting of a great professional engineering society this knowledge was freely and properly made known to all who were interested. In no other country and in no other time can parallel conditions be found. The presentation of such papers in such a way reaffirms the belief in the supremacy of American engineering talent and the soundness and unselfishness with which that talent is dedicated to public service.

Wanted— a Commercial Moses

NOW that most of the central-station men who attended the N. E. L. A. convention at Atlantic City have returned to their desks it is fitting that they should pause and calmly take stock of the commercial status of their industry. By and large, the commercial program at the convention was notable for its recognition of the problems of developing the enormous potential market for the sale of central-station service. There was, however, a lamentable lack of definite proposal of methods for solving these problems. Viewed solely upon the merit of ultimate good to the industry, two statements were made that should serve to jolt commercial men out of their present condition of somnambulism.

In discussing the costs of appliance merchandising, John F. Gilchrist declared that there is no profit in that branch of the business for either the central station or the independent dealer and cited figures compiled from the merchandising operations of eleven companies which showed an over-all loss of 4.4 per cent. Yet an analysis of these data shows that six of the eleven companies did make money and the 4.4 per cent loss was caused by the heavy losses of two companies. Furthermore, it is known that there are some non-electrical dealers—namely, the department stores—which are making money out of the sale of appliances. Both they and some central-station companies have found it so profitable that they are expanding their merchandising facilities. Evidently somebody knows how to make money out of this business.

The second important statement was that of Charles J. Russell, who, in his plea for power and authority for the commercial branches commensurate with their responsibility, pointed out that much of the business gained by central-station companies of late years has been literally thrust upon them. Their growth has been due to external rather than internal causes.

On these two counts the central-station industry stands indicted for failure to "cash in" on an almost unlimited field for the sale of its service. A good many excuses for this situation could be found, but the chief reason has been the backwardness of commercial men in getting together, working out concrete plans and applying tried and proved methods for getting the business. There are companies whose commercial operations have been exceptionally successful, but the men in charge of them have been loath to assume the duties of leadership and broadcast to the industry the benefit of their experience and knowledge. What is needed now more than anything else is a commercial Moses who can point to a record of results and who can and will use the knowledge thus gained to lead his fellows out of the wilderness. Such a man should be appointed chairman of the Commercial Section for the ensuing year.

Determination of Practical Ratings of Power Systems

IN THE design of any structure, such as a bridge, a roof, a building, a steel tower, the civil engineer can determine with accuracy the steady, fixed or "dead" load which that structure can carry without collapse. He well knows, however, that the structure will not support the same tonnage if it is a moving or "live" load, and he has devised methods of determining what reduction he must make from the safe dead load to ascertain the safe live load.

It appears that the situation is not different in the case of the maximum load a power transmission system will carry or transmit under steady conditions and the actual load it is safe for it to carry under actual operating conditions if it is not to run the risk of losing its load when some large increase is suddenly demanded.

Thus Messrs. Evans and Bergvall in their article in this issue present what they term a simple, graphical method of determining the maximum output of a system where it is assumed that the load is added by sufficiently small increments not to introduce any shock which would disrupt a nice balance and condition of synchronism. But they warn readers that this does not give the permissible loading. However, it is pointed out that, with the maximum output determined, their graphs do help in estimating how great a shock in a sudden increase in load the system would stand under certain assumed conditions and therefore how much of a reduction in maximum output it is necessary to make to obtain permissible loading. The problem of the civil engineer with his bridge is in the end to estimate the probable shocks the structure must resist in its live loads. And likewise the application of any method of determining practical ratings of transmission power systems is apparently a direct function of the ability to estimate the probable shock the system is likely to be called upon to sustain.

Present Necessity and Future Requirements in Estimating Pole Strength

ON SOME transmission and distribution systems it is not unusual to find the weakest line supports where the strongest are needed and vice versa. Possibly this is due to the system having grown in a way which was unforeseen when the line was erected, but there is no doubt that in many cases sufficient consideration is not given to the relative strength of the pole. This is hardly to be wondered at in small organizations, because pole-strength calculations in the past have entailed a rather arduous task. By using the tables which J. Howard Mathews presents in this issue this task should be less burdensome than it has been.

A word of warning should be sounded, however, about the use of these or similar tables. Strength of poles for initial requirements is not the only consideration in building a line. The rapid growth of the utility business is a very important consideration. It is almost impossible to tell what the developments will be in ten years. Lines which may seem relatively unimportant now may develop into importance. Other lines, although this is less likely, may not gain in importance for years. A little foresight will often avoid the necessity of complete rehabilitation. For example, there is no one who knows at this time to what extent rural development will be carried, but surely rural lines, considered unimportant now, will not be so esteemed ten years hence. The service given from these lines will have to compare favorably with that given from city lines. Consequently the poles must be selected for more than immediate strength requirements.

The life of poles also must be carefully considered. If a small pole is erected and has to be replaced within a few years because of decay, it is more expensive than to install a larger pole in the first place. The decay usually starts at the ground line, and many poles which have been standing only a few years are considerably reduced in circumference at this point. If the pole is only large enough to have the required strength when first installed, and then decay takes away, say, half an inch around the ground line, a large percentage of its strength, the amount varying with its size, has been eliminated. Of course, proper butt treatment of poles minimizes the tendency to decay, many companies figuring that with such treatment poles will endure for twenty years or longer.

Considering the limitations of Mr. Mathews' tables aside from the judgment which must be brought to bear in applying them, it must be pointed out that the ground-line circumference given by the tables may not always give the proper pole-top diameter. For example, the tables state that 50-ft. poles carrying two conductors with 100-ft. spans need be only 28 in. in circumference at the ground line. This would make a pole about 9 in. in diameter at the ground line, and the diameter at the top would depend to a great extent on the kind of pole used. In most cases it would seem that a 50-ft. pole which is 9 in. in diameter at the bottom would run to a point at the top. Hence the minimum top diameter would be the ruling consideration. In the case of 25-ft. poles with two conductors carrying 100-ft. spans the diameter at the ground line should be between 6 in. and 7 in., according to the tables. Such a pole would surely be very small at the top, so again the minimum top diameter should be the ruling consideration.

There will doubtless be many suggestions for additions to or modifications of the tables. For instance, in the example on page 1175 the work would be much simplified if tables of pole diameters at the top, one-third the distance from the top, and six feet from the butt, for several grades and kinds of poles, were included. There is also some difficulty in applying Mr. Mathews' method in solving the longitudinal load on poles where the line dead-ends. This is because the scales of the chart do not carry out far enough. In the opinion of many engineers the longitudinal load is of greater importance than the transverse load.

In general, it is suggested that the tables presented by Mr. Mathews should be used only as a guide to the minimum size of poles to be installed. They will probably be found particularly useful in the analysis of conditions at crossings and other places where special study is required for individual poles. But it is doubtful if the so-called strength of a line can be determined solely from a study of the individual strength of the poles in the line—if, in fact, it can be determined definitely in any way. With the information Mr. Mathews imparts, however, the engineer who is watching the growth of his system and its probable future tendencies will be able to lay out transmission and distribution system lines with more provision for future development than has been the case in the past, always remembering, of course, that like all short cuts to engineering solutions, the tables cannot be advantageously used without the exercise of judgment.

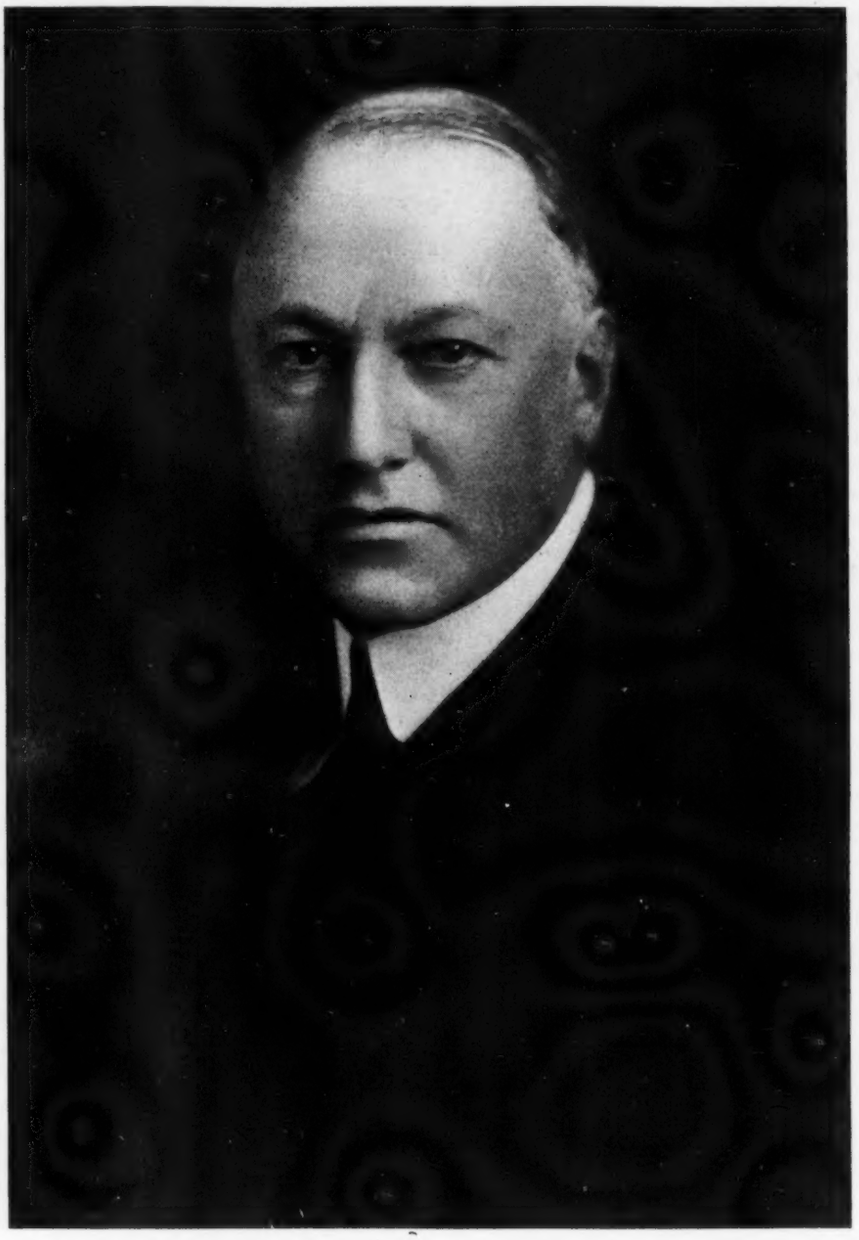
Organization Study Pays Dividends in Money and Service

CONSECUTIVE visits to several operating utility companies bring out strikingly the differences in organization methods used to achieve the same results. On some properties an extremely able administrator dominates and practically carries all the activities of the company as part of his duties. In other cases the vice-presidential administrative organization with superintendents in charge gives good results. Still further down the line very great contrasts occur in the methods of handling business. Engineering, commercial, legal and financial activities are often required of the same executive, and in other cases they are allotted so rigidly to different executives that team work becomes a real problem.

In their rapid growth and with the unprecedented demands upon them to extend their fields of activity it has been very difficult for the utility companies to institute an operating organization that represents the result of real study and investigation. But the size of some of the present-day properties and the magnitude of the interests involved now make it essential for most companies to study problems of organization. A rounded and active development of all phases of the light and power business calls for a division of responsibility and a co-ordinated program of development. Proper division of responsibility together with strict executive accounting for results should be fundamental, but in addition real conferences between executive heads are required to keep them all in tune with the system plans. Much has been done along these lines, but much remains to be done before even the most successful company can rest contented with its administrative organization.

Franklin Silas Terry

An executive of exceptional organizing ability who has been a pioneer in the development of the lamp industry.



SOME men achieve great results by force, by will power, by driving strength and their ability to bend men to their purposes. It is an interesting thing sometimes to see, on the other hand, how vast a constructive influence may be harnessed behind clear thinking, systematic organization and the inspiration of a personality. Such has been the secret of the success of Franklin S. Terry, vice-president of the General Electric Company and chairman of the advisory board of the National Lamp Works, who has been the outstanding leader in the creation of the incandescent lamp industry, which has attained such great proportions.

Mr. Terry was born in Ansonia, Conn., in 1862. His first position was with the Electrical Supply Company of Ansonia, and in 1884 he went to Chicago to establish a branch of this company, with which he continued for many years. In 1889 he organized the Sunbeam Incandescent Lamp Company of Chicago, of which he took personal charge, directing his energies to the improvement of the product and the development of greater demand for various types and designs of lamps. In 1901 the Sunbeam company was purchased by the National Electric Lamp Company, of which Mr. Terry was one of the organizers. In 1911, when the National Electric Lamp Company was merged with the General Electric Company, Mr. Terry became co-manager with B. G. Tremaine of the National Lamp Works at Nela Park, Cleveland.

Mr. Terry has been a great builder in the lamp business. He possesses a keen, analytical mind and is an apostle of system, efficiency and harmony among men. The merging of the many competing lamp companies into one producing and selling organization was his conception. Working constantly in co-operation with Mr. Tremaine, he brought order into the lamp business and established at Nela Park an institution unique in industry. He was one of the founders of the National Electric Light Association in 1885 and served on its incandescent lamp committee for many years.

Maximum Output of Transmission Systems

Simple Graphical Method for Determining Maximum Output of Any Given System—Maximum Permissible Load an Entirely Different Matter—Its Determination Is a Difficult Problem, but Estimates May Be Made

By R. D. EVANS and R. C. BERGVALL
General Engineers Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

FOR any given power system, the maximum output is a definite quantity which may be easily determined. The maximum permissible load, however, depends on a number of factors and characteristics peculiar to the particular situation, such as system conditions and service requirements, and the character of equipment connected to the system, all of which vary from one system to another, even though the physical characteristics of the systems themselves are similar. Thus the determination of the permissible load is a very complicated problem, and the maximum permissible load or the "rating" of a power system is not a definite quantity like the maximum output of that same system.

It is possible to determine the maximum output under conditions where the load is increased in very small increments. The permissible loading, on the other hand, must provide for relatively large increments in power demand. Knowing the maximum output, it is possible, however, to obtain an estimate of the reduction to make to determine the permissible load or rating by assuming that the inertia effect of the synchronous condenser and of the load and the demagnetizing effect of armature currents will all be exerted previous to the operation of governors and voltage regulators. As shown later by example, it is possible on this basis to estimate whether a given system will pull out of step with a definite increase in load.

The present article presents briefly a simple graphical method for determining the maximum output of transmission systems. This method is applicable to any alternating-power current system for determining the maximum load that may be delivered without loss of synchronism. This method is of particular interest in connection with long-distance transmission of power at 60 cycles, because the minimum load from an economic point of view approaches the normal rating of the transmission system.

The output of the power system for particular voltage conditions is limited by the characteristics of the load and synchronous condensers that may be used for regulating purposes, as well as by the characteristics of the transmission line and generating equipment.*

The output and stability of a power system may be described in general terms as being limited by the drop in voltage and shift in phase position, which prevent the circulation of current to increase the output and maintain synchronism. Of commercial types of load the synchronous and induction motors, possessing substantially constant power characteristics independent of variation in voltage, impose the more severe requirements from the standpoint of maintaining synchronism. Hence, loads of constant true power requirements will be assumed as the basis of the following discussion.

*"Experimental Analysis of the Stability and Power Limitations of Transmission Systems," by R. D. Evans and R. C. Bergvall; also "Limitations of Output of a Power System Involving Long Transmission Lines," by E. B. Shand; both papers presented at the midwinter convention of the A. I. E. E. in February, 1924.

DESCRIPTION OF THE METHOD

The method will be described briefly in connection with an example designed to illustrate it.

Data for Illustrative Example:

(1) Transmission line, three-phase, 60-cycle, 750,000-circ.mil copper conductors with 2-ft. equivalent spacing.

(2) Supply voltage assumed constant (generator and step-up transformer impedances neglected).

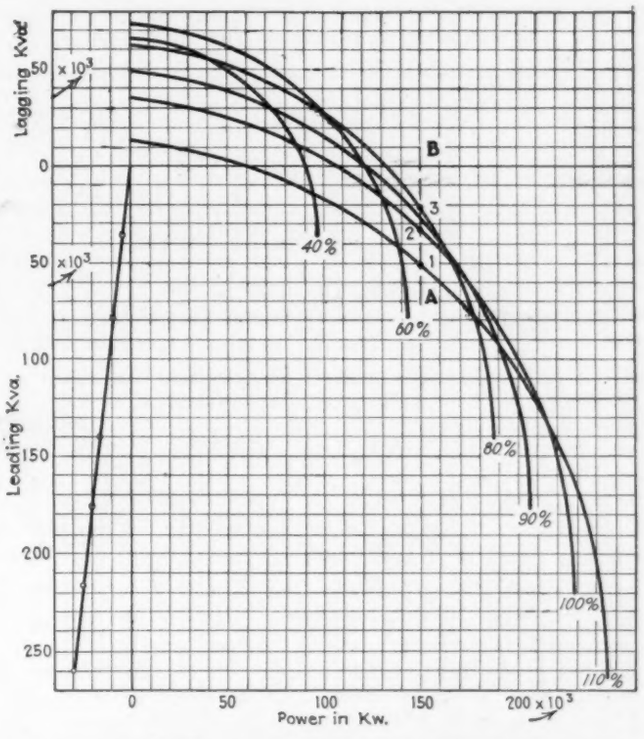


FIG. 1—THE P_R-Q_R DIAGRAM OF THE TRANSMISSION LINE; SUPPLY VOLTAGE ASSUMED CONSTANT AT 220-KV. RECEIVER VOLTAGE EXPRESSED IN PER CENT OF 220 KV.

(3) Load 100 per cent power factor independent of voltage.

(4) Condenser 100,000-kva. lead and 42,000-kva. lag.

(5) The load and condenser output are assumed to be measured on the high-voltage bus at the receiver.

The method involves four steps which, for convenience, will be designated at steps 1, 2, 3 and 4.

Step 1—The P_R-Q_R Diagram of the Transmission Line:

The first step is to plot the characteristic curves of the transmission line, showing the relation between the receiver real and reactive power, P_R and Q_R, for certain

assumed supply and receiver voltages. This relation is a circle and the diagram is called the power circle diagram. The method of plotting this diagram has been described frequently. A very complete discussion has been given by Messrs. Evans and Sels in articles published in the *Electric Journal*†, and more recently in a paper on "Power Limitations of Transmission Systems," presented before the A. I. E. E. in February, 1924.‡ The diagram for the 250-mile transmission line chosen is shown in Fig. 1.

†*Electric Journal*, July, August and December, 1921, and February, 1922.

‡An alternative method for obtaining this diagram has been developed in the paper "Some Theoretical Considerations of Power Transmission," by C. L. Fortescue and C. F. Wagner, presented before the A. I. E. E. in February, 1924.

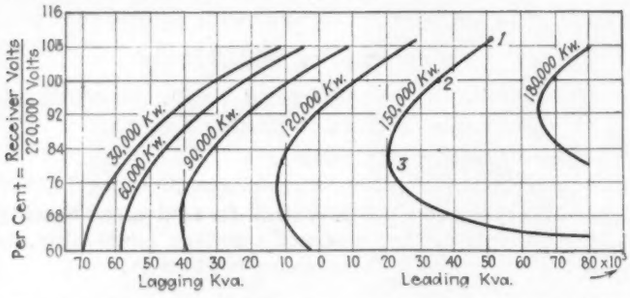


FIG. 2—THE E_R-Q_R DIAGRAM OF THE TRANSMISSION LINE; 220,000 VOLTS CONSTANT AT THE SUPPLY END

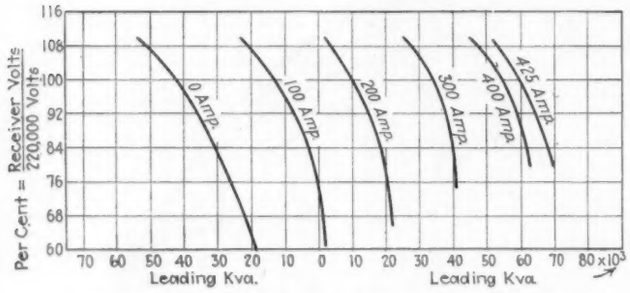


FIG. 3—THE E_L-Q_L DIAGRAM OF THE LOAD, INCLUDING SYNCHRONOUS CONDENSERS

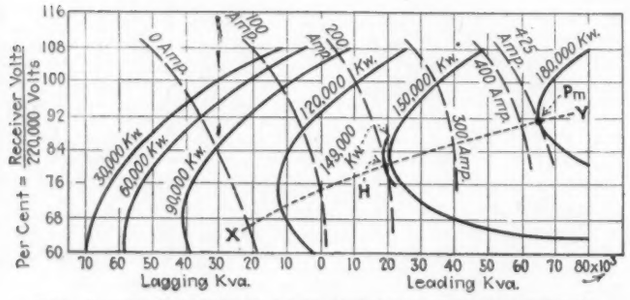


FIG. 4—TRANSMISSION LINE AND LOAD CHARACTERISTIC CURVES—FIG. 2 AND FIG. 3 SUPERPOSED

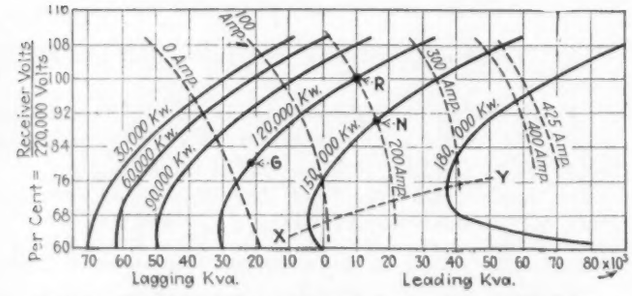


FIG. 5—TRANSMISSION LINE AND LOAD CHARACTERISTIC CURVES, SHOWING THE STABILIZING EFFECT OF 30 PER CENT RESISTANCE LOAD; KW. IS AT 100 PER CENT VOLTAGE

Step 2—The E_R-Q_R Diagram of the Transmission Line:

The second step is to plot a series of curves between the receiver voltage, E_R, and the receiver reactive power, Q_R, for a number of constant receiver loads, expressed in kilowatts. These curves may be obtained from Fig. 1 by plotting, for example, the vertical intercepts of the line *A-B* for 150,000 kw., the points 1, 2 and 3 as shown in Fig. 2.

Step 3—The E_L-Q_L Diagram for the Load:

The third step is to plot the corresponding series of curves between the load voltage, E_L, and the reactive power, Q_L, of the load, including the synchronous condensers that may be employed. For the illustrative example, the Q_L of the load is assumed to be zero, and the curves become merely that of the synchronous condenser output in kva. for different voltages for a number of definite synchronous condenser excitations. The curves for the synchronous condenser are shown in Fig. 3.

Step 4:

This step involves merely the super position of the E_R-Q_R curves of the transmission line and the E_L-Q_L curves of the load including synchronous condensers, shown by Figs. 2 and 3 respectively, thus producing the diagram Fig. 4. These two families of curves become tangent along the line *X-Y*, which indicates the point of instability of the power transmission system for particular values of supply voltage, receiver load and condenser excitation. For example, with 200 amp. excitation, a gradual increase in the load will reduce the receiver voltage to 80 per cent normal, corresponding to 149,000 kw. load as shown at *H*, at which point pull-out will occur. The maximum amount of power that may be delivered for the particular transmission line, condenser and type of load assumed is shown by the point P_m in Fig. 4, corresponding to 180,000 kw. at 91 per cent voltage.

The method of determining the maximum output of a power system in the simple form described above neglects a number of factors in the problem. Fortunately, the method may be extended to include these factors. The effect of step-up or step-down transformers may accurately be taken into account by including the transformers as part of the transmission line, thus modifying the circle diagram, Fig. 1. This method is explained in considerable detail in the articles by Evans and Sels previously referred to. The effect of the generator impedances may be included in a similar manner, except that proper allowance must be made for the internal voltage of the generator, which voltage may be higher than the terminal voltage, and the circle diagrams should take this internal voltage into account.

The method described above may be modified to provide for a load having a power factor different from unity. In this case it is necessary to add algebraically the reactive kva. of the synchronous condensers to obtain a new E_L-Q_L diagram showing the combined effect of load and condensers. The method may also be modified to provide for changes in either the real or reactive component of power, or in both, for changes in voltage. For example, assume that 70 per cent of the total load consists of motors of constant power requirements, expressed in kw., and assume that the remaining 30 per cent of the load consists of lighting or resistance load varying with the square of the voltage. Assume also that the power factor of the load is 100 per cent and

independent of voltage. For this case, the E_R-Q_R diagram for the transmission line would be modified as shown by the solid lines in Fig. 5. These curves at 100 per cent voltage correspond exactly to the curves in Fig. 3. Other points—for example, the point G in Fig. 5—may be calculated in the following manner: A load of 120,000 kw. at 100 per cent voltage would drop to 107,000 kw. at 80 per cent voltage (= 84,000 kw. in motor load + 36,000 kw. $\times$ 0.80^2 in lighting load). From Fig. 1, the reactive kva. of the receiver must equal 21,500 kva. lagging for 80 per cent voltage and 107,100 kw.

The method may similarly be extended to solve the more complicated problems involving one or more intermediate synchronous condensers. Modifications of the method have been illustrated sufficiently to indicate its general applicability for determining the maximum output of power systems.

Referring to the statement that it is possible to estimate the permissible load under certain conditions when the maximum output is known, consider the power system described by Fig. 5 and assume that it is operating at 120,000 kw. at 100 per cent voltage; i.e., point R. If the load on the system is suddenly increased to 150,000 kw. and the excitation does not change, the voltage will drop to 90 per cent, corresponding to the point N (Fig. 5), which indicates stable operation. Thus, while this simple graphical method here presented is useful directly for determining the maximum output of a power system for small increments of load, the method also gives considerable information as to the stability of a power system for large sudden increases in output.

Determination of Pole Sizes

Table Permitting Quick Calculation of Pole Size for Most Any Type of Line and Facilitating Calculation of Type of Line that Can Be Carried on Selected Poles—Based on National Electrical Safety Code

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THE National Electrical Safety Code of the Bureau of Standards and the requirements of most state commissions call for certain grades of construction, namely, A, B, C, D and E, for electric and telephone lines. It is not unusual, however, to find the weakest support used where the strongest is needed, and vice versa. Many utilities do not have the engineering facilities to determine the required strength of supports, and many of the larger organizations do not take the time. It is often felt that the time required for computation is not justified, with the result that some more or less routine policy is followed of using a given size of pole for almost any kind of construction. It is following the line of least resistance, and not uncommon practice, for the construction man to prescribe a pole with 6-in. or 7-in. top for almost every kind of line, whether it be a long-span, double-circuit, large-capacity line serving a number of municipalities or important industrial centers or whether it is a light unimportant rural line to serve two or three consumers.

Where not properly designed, many unimportant distribution or transmission lines have been found with a factor of safety of five or more, whereas the important line, which should be substantial and render reliable service and should have a factor of safety of at least two, may be built with a factor of safety of one. The efficient engineer will see to it that money is spent where service and financial return warrant construction of a substantial character and that savings are effected by smaller poles or longer spans where less strength is needed.

It is not uncommon practice for utilities to use 7-in.-top Western red-cedar poles spaced 150 ft. to carry a single-phase No. 6 copper-conductor line into a rural district. On the other hand, it is possible to find some utility, possibly the same one, erecting a transmission line to carry six No. 4/0 steel-reinforced aluminum conductors on 40-ft., 8-in.-top poles spaced 300 ft. Calculations made on the basis of Grade C for the first line and Grade B for the second show that the first would have a factor of safety of approximately five and the other a factor of safety of a little more than one, the important line having a factor of safety one-quarter or one-fifth time that of the rural line. With such figures before him, an engineer or public utility official would concede that errors had been made in the design of one or both of these lines.

The above analysis will serve to show the inconsistencies from a practical point of view of some electric line design and construction. The same is even more true of telephone construction.

Reasons for Poor Pole Selections

There are several contributing reasons why these inconsistencies are found in daily practice. The responsible official may not have realized the importance of giving attention to line design. He may not have time to devote to the matter, or the organization may have no one capable of handling it. Generally speaking, the selection of proper pole sizes is probably more of a hit-or-miss proposition than any other feature of electrical design. Regardless of whether the engineer has a realization of the importance of proper pole and line design and regardless of whether he has ability, opportunity and inclination, he will in most cases prefer to conserve as much time as possible.

With the foregoing conditions in mind, the tables presented herewith have been made up to facilitate compliance with given grades of construction. They give ground-line circumferences (to the nearest inch) for the usual conditions to be found in commercial practice. Some groupings of conductor sizes have been made for the sake of simplicity, but accuracy has not been sacrificed to any appreciable degree. Irregularities in pole shapes and material might easily inject a greater error. Grades, loading, pole fiber stresses and methods of calculation conform to the recommendations of the

Table I—Ground-Line Circumference of Poles Required for Any Number of Conductors of Any Size and for Any Span Ordinarily Used in Practice

The values in the tables are for Grade B construction, heavy loading and poles having an allowable fiber stress of 2,500 lb. per square inch. For other conditions multiply the table values by the proper factor selected from Table II. Span length is one-half the sum of the spans adjacent to the pole.

In the case of telephone wires (lower table) proper consideration has been given to the fact that two or three cross-arms will be used where twenty and thirty wires are carried. In all other cases the conductors are assumed on a single cross-arm at the top of the pole. Where the average height of wires is less than the height (above ground) of the pole, 1 in. may be subtracted from the pole circumference as given in the table for each 2 ft. of such difference.

T.B. W.P.	Solid Copper	Stranded Copper	A.C.S.R.	Span	25-Ft. Poles Conductors					30-Ft. Poles Conductors					35-Ft. Poles Conductors					40-Ft. Poles Conductors					45-Ft. Plles Conductors					50-Ft. Poles Conductors					55-Ft. Poles Conductors					60-Ft. Poles Conductors					Span
					2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	2	3	4	5	6	
				100	20	22	24	26	27	22	24	27	28	30	24	26	28	30	32	25	28	30	32	34	27	29	32	33	35	28	31	33	35	37	30	33	35	37	39	31	34	36	38	40	100
				125	21	23	25	27	29	23	26	28	30	32	25	28	30	32	34	26	29	32	34	36	28	31	33	35	37	30	33	35	37	39	31	34	37	39	41	33	36	39	41	43	125
				150	22	25	27	29	31	25	28	30	32	34	26	29	32	34	36	28	31	34	36	38	30	33	35	37	39	31	34	37	39	41	33	36	39	41	43	34	38	41	43	45	150
				175	23	26	28	30	32	26	29	31	33	35	27	31	33	36	38	29	32	35	38	40	31	34	37	39	41	32	35	38	41	43	34	37	40	43	45	35	39	42	45	47	175
000		300,000 circ.mils	267,000 circ.mils	200	24	27	30	32	34	27	30	33	35	37	28	32	34	37	39	30	33	36	39	41	32	35	38	41	43	33	37	40	43	45	35	39	42	45	47	36	40	44	47	49	200
				225	25	28	31	33	35	28	31	34	36	38	29	33	36	39	41	31	35	38	41	43	33	36	39	42	45	35	38	41	44	46	36	40	43	46	48	37	41	44	47	50	225
00		250,000 circ.mils	0000	250	26	29	32	34	37	29	32	35	38	40	30	34	37	40	42	32	36	39	42	44	34	38	41	44	46	36	40	43	46	48	37	41	44	47	50	38	43	46	49	52	250
				275	27	30	33	36	38	30	33	36	39	41	31	35	39	41	44	33	37	40	43	45	35	39	42	45	47	37	41	44	47	49	38	42	46	48	51	39	44	48	51	53	275
0		0000	000	300	28	31	34	37	39	31	34	37	40	42	32	36	40	42	45	33	38	41	44	47	36	40	43	46	49	37	41	45	48	51	39	44	47	50	53	40	45	49	52	55	300
				325	28	32	35	38	40	31	35	38	41	43	32	37	40	43	46	34	39	42	45	48	36	40	44	47	50	38	43	46	49	52	39	44	48	51	54	41	46	50	53	56	325
				350	29	33	36	39	41	32	36	39	42	44	33	38	41	44	47	35	40	43	46	49	37	41	45	48	51	39	44	47	50	53	40	45	49	52	55	42	46	51	54	57	350
				100	20	22	24	26	27	21	23	26	27	29	23	26	28	29	31	25	27	30	31	33	26	29	31	33	35	28	30	32	34	36	29	32	34	36	38	31	34	36	37	39	100
				125	21	23	26	27	29	22	25	27	29	31	24	27	29	31	33	26	29	31	33	35	27	30	33	35	37	29	32	34	36	38	30	33	36	38	40	32	35	38	40	42	125
				150	22	25	27	29	31	24	27	29	31	33	25	28	31	33	35	27	30	33	35	37	29	32	35	37	39	31	34	36	38	40	32	35	38	40	42	34	37	40	42	44	150
1	0000	000	00	175	23	26	28	30	32	25	28	31	33	35	26	29	32	35	37	28	32	34	37	39	30	34	37	39	41	32	35	38	40	42	33	37	39	42	44	35	38	41	44	46	175
2	000	00	0	200	24	27	30	32	34	26	29	32	34	36	27	30	33	36	38	29	32	35	38	40	31	35	38	40	42	33	36	39	42	44	34	38	41	44	46	36	39	42	45	47	200
				225	25	28	31	33	35	27	31	33	36	38	28	32	35	38	40	30	34	37	40	42	32	36	39	42	44	34	38	41	44	46	35	39	42	45	47	37	41	44	47	49	225
3		0		250	25	29	31	34	36	28	32	35	37	39	29	33	36	39	41	31	35	38	41	43	33	37	40	43	45	35	39	42	45	47	36	40	44	46	49	38	42	46	49	51	250
				275	26	30	32	35	37	29	33	35	38	40	30	34	37	40	42	32	36	40	42	45	34	38	41	44	46	36	40	43	46	48	37	41	45	47	50	39	43	47	49	52	275
4				300	27	31	33	36	38	30	34	37	39	41	31	35	38	41	43	33	37	41	43	46	34	39	42	45	48	37	41	45	48	50	38	42	46	49	52	40	44	48	51	54	300
				325	27	31	34	37	39	30	34	37	40	42	31	35	39	41	44	33	38	41	44	47	35	39	43	46	49	37	42	45	48	51	38	43	47	50	53	40	45	49	52	55	325
				350	28	32	35	38	40	31	35	38	41	43	32	36	40	42	45	34	39	42	45	48	36	41	44	47	50	38	43	46	49	52	39	44	48	51	54	41	46	50	53	56	350
				100	19	21	23	25	26	21	23	25	27	28	23	25	27	29	30	24	27	29	30	32	26	28	31	32	34	27	29	32	33	35	29	31	34	35	37	30	32	34	36	38	100
				125	20	22	25	26	28	22	24	27	28	30	24	26	29	30	32	25	28	30	32	34	27	30	32	34	36	28	31	33	35	37	30	33	35	37	39	31	34	36	38	40	125
				150	21	23	26	27	29	23	26	28	29	31	25	28	30	32	34	26	29	32	34	36	28	31	34	36	38	30	33	35	37	39	31	34	37	39	41	33	36	38	40	42	150
5	00	1	1	175	22	25	27	29	31	24	27	29	31	33	26	29	31	33	35	27	30	33	35	37	29	33	36	38	40	31	34	36	38	41	32	35	38	41	43	34	37	40	42	44	175
6	0	2	2	200	23	26	28	30	32	25	28	30	32	34	27	30	33	35	37	28	31	34	37	39	30	33	36	39	41	32	35	38	41	43	33	37	40	43	45	35	39	41	44	46	200
				225	24	27	30	32	34	26	29	32	34	36	28	31	34	36	38	29	32	35	38	40	31	35	38	41	43	33	36	39	42	44	34	38	41	44	46	36	40	43	45	47	225
7	1	3	3	250	24	28	30	33	35	26	29	32	35	37	29	33	35	38	40	30	34	37	40	42	32	36	39	42	44	34	37	40	43	46	35	39	42	46	48	37	41	44	47	49	250
				275	25	28	31	34	36	27	30	33	36	38	30	33	36	39	41	31	35	38	41	43	33	37	40	43	45	35	39	42	45	47	36	40	44	47	49	38	42	45	48	50	275
8	2		4	300	26	29	32	35	37	28	32	34	37	39	31	34	37	40	42	32	36	39	42	44	34	38	41	44	47	36	40	44	46	49	37	42	45	48	51	39	43	47	50	52	300
				325	26	30	33	36	38	28	32	35	38	40	31	35	38	41	43	32	36	40	42	45	34	39	42	45	48	36	40	44	47	50	37	42	46	49	52	39	44	47	50	53	325
				350	27	31	34	37	39	29	33	36	39	41	32	36	39	42	44	33	37	31	43	46	35	39	43	46	49	37	42	45	48	51	38	43	47	50	53	40	45	48	51	54	350
				100	19	21	22	24	25	20	22	24	26	27	22	24	26	28	29	24	26	28	30	31	26	28	30	32	33	27	29	31	33	34	28	30	33	34	36	30	32	34	36	37	100
9	3	4	5	125	20	22	24	26	27	21	23	26	27	29	23	25	28	29	31	25	27	30	31	33	27	29	32	33	35	28	30	33	34	36	29	32	34	36	38	31	33	36	37	39	125
10	4	5	6	150	21	23	25	27	28	22	24	27	28	30	24	27	29	31	33	26	29	31	33	35	28	31	33	35	37	29	32	34	36	38	30	33	36	38	40	32	35	38	40	42	150
				175	22	24	27	28	30	23	26	28	30	32	25	28	30	32	34	27	30	32	34	36	29	32	34	36	38	30	33	36	38	40	31	34	37	40	42	33	36	39	41	43	175
	5	6	7	200	22	25	27	29	31	24	27	30	32	33	26	29	32	34	36	28	31	34	36	38	30	33	36	38	40	31	34	37	39	41	32	35	38	41	43	34	38	40	43	45	200
	6	7	8	225	23	26	28	30	32	25	28	31	33	35	27	30	33	35	37	29	32	35	37	39	31	34	37	39	41	32	35	38	41	43	33	37	40	43	45	35	39	42	45	47	225
				250	24	27	29	31	33	26	29	32	34	36	27	31	34	37	39	29	33	36	39	41	31	35	38	41	43	33	36	39	42	44	34	38	41	44	46	36	40	43	46	48	250
	7	8		275	25	28	30	32	34	27	30	33	35	37	28	32	35	38	40	30	34	37	40	42	32	36	39	42	44	34	38	41	44	46	35	39	43	46	48	37	41	44	47	49	275
	8			300	25	28	31	33	35	28	31	34	36	38	29	33	36	39	41	31	35	38	41	43	33	37	40	43	45	35	39	42	45	47	36	40	44	47	49	38	42	46	48	51	300
				325	26	29	32	34	36	28	31	34	37	39	29	33	37	40	42	31	35	39	42	44	33	37	41	44	46	35	39	43	45	48	36	41	44	47	50	38	42	46	49	52	325
				350	27	30	32	35	37	29	32	35	38	40	30	34	38	41	43	32	36	40	43	45	34	38	42	44	47	36	40	43	46	49	37	41	45	48	51	39	44	47	50	53	350
					2	6	10	20	30	2	6	10	20	30	2	6	10	20	30	2	6	10	20	30	2	6	10	20	30	2	6	10	20	30	2	6	10	20	30	2	6	10	20	30	...
All telephone wires				100	18	25	29	32	35	20	27	31	34	38	22	29	33	36	40	23	31	36	38	43	25	32	37	40	44	27	34	39	42	46	28	35	40	44	48	30	37	42	45	50	100
				125	19	27	31	34	38	21	29	33	37	41	23	31	35	39	42	25	33	38	41	46	26	34	39	43	47	28	36	41	45	49	29	37	43	47	51	31	39	45	48	54	125
				150	20	28	33	36	40	22	30	35	39	43	24	32	37	41	45	26	34	40	43	48	27	36	41	45	50	29	38	43	47	52	30	39	45	49	54	32	41	46	51	57	150
Where there are more than ten telephone wires, two-thirds of total number have been used in calculations.				175	21	30	35	38	42	23	32	37	41	45	25	34	39	43	48	27	36	42	46	51	28	38	43	48	53	30	40	45	50	55	31	41	47	52	57	33	43	49	54	60	175
				200	22	31	36	39	44	24	33	39	43	47	26	35	41	45	50	28	37	43	48	53	29	39	45	50	55	31	41	47	52	58	32	42	49	54	60	34	44	51	56	63	200

National Electrical Safety Code. The table is based on Grade B heavy loading and on poles having an allowable fiber stress of 2,500 lb. These are believed to be the conditions most usually obtaining. However, the list of constants appended to the table contains all the factors necessary to modify the tabulated values to meet any grade of construction and any kind of poles or loading.

The table, supplemented by the list of constants, gives results for fifty-three sizes of different kinds of conductors, eight pole lengths, eleven span lengths, five wire loads (two to six, inclusive, for supply wires and two, six, ten, twenty and thirty telephone wires), seven kinds of poles, five grades of construction (A, B, C, D and E) and three loading districts (heavy, medium and light).

Grades A, B, C, D and E, as defined in the National Electrical Safety Code, are based on conditions of hazard only. These grades of construction might be further defined to cover service conditions as well as hazard. That is, important electric lines regardless of hazards and conflicts might be of Grade B construction, and unimportant lines, such as rural service lines or transmission lines to small communities, might be of Grade C construction. More specifically, Grade B construction might be taken to include electric lines having a certain maximum demand, say 100 kw., or serving more than a given number of consumers. This, however, has no bearing on the application of the table after a given grade has been decided upon.

WOODEN-POLE COMPUTER

The accompanying table, which would have required some 2,500,000 calculations if it had been prepared by formulas, was developed by the help of a rapid computer devised by the writer. The computer is shown in the accompanying illustration. The device consists of two concentric disks supported so as to rotate on a piece of cardboard, the upper disk having a handle-like extension. The height of wires and poles is shown on the upper disk, span lengths and pole diameters on the lower disk, and conductor sizes, moments for grades A, B and C and pole sizes corresponding to total moments on the lower cardboard.

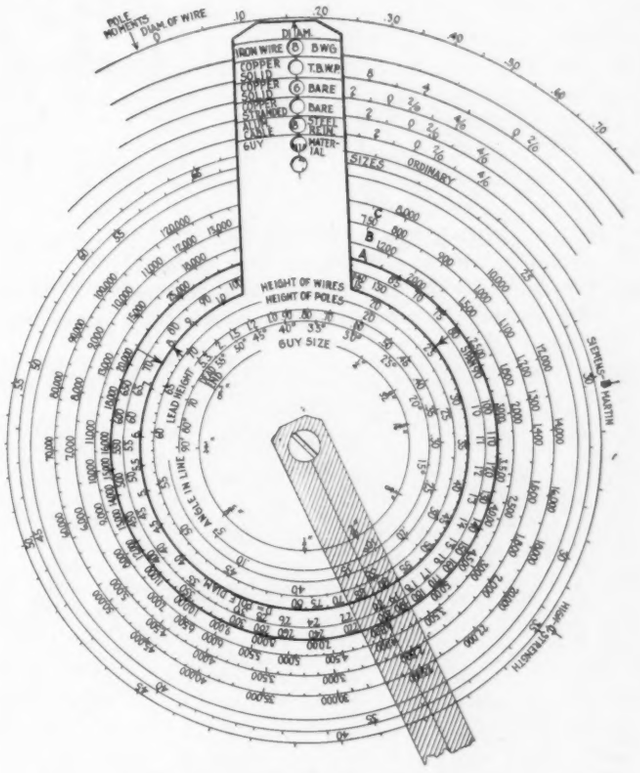
In addition to the uses described elsewhere somewhat in detail, the computer may be used to determine the size of transverse and longitudinal guys for various conditions of loading, any ratios of leads to height, any angle in line and four different kinds of guy-strand material. The computer may be used for any kind of conductor up to ¾ in. in diameter, any height of wires from 20 ft. to 80 ft., any span length from 65 ft. to 650 ft., and for poles having 1,800 lb. or 2,500 lb. allowable fiber stress ranging from 22 in. to 67 in. in circumference at the ground line.

USE OF TABLE FOR COMPLEX LOADING

Where poles support various kinds of conductors at different heights on the pole, the proper pole size cannot be read directly from the table. It is possible, however, in complex cases of this character to arrive at the proper pole size in the following manner. Find from the table the size of pole required for each of the conditions of loading, assuming the pole to support only such load. The size of pole necessary to support the combined loads will be the cube root of the sum of the cubes of the different sizes required to support the individual loads as taken from the table.

Illustration.—Assume three No. 0 aluminum cable steel reinforced on a single cross-arm on the top of 40-ft. Western red-cedar poles, spaced 200 ft., and six No. 6 insulated copper conductors supported 5 ft. below the top of the pole. The table shows that if the pole carried only the aluminum conductors a ground-line circumference of 32 in. would be required and if it carried only the No. 6 conductors a 37-in. pole would be required. The cube root of the sum of the cubes of the two pole sizes required for the different loadings would be the cube root of 32^3 plus 37^3, or 43.7 inches.

Actual calculations show the total moment on the pole and the proper size to be as follows: Three No. 0 aluminum conductors, 19,000 lb.-ft.; six No. 6 insulated wire conductors, 31,000 lb.-ft.; pole, 3,500 lb.-ft.; total, 53,500 lb.-ft.



WOODEN-POLE COMPUTER USED IN COMPILING TABLE

To Determine Proper Size of Pole.—To determine the moment for any given conductor, the upper disk is rotated until the size of the conductor considered is visible through the proper hole in the handle. The lower disk is then rotated until the arrow shown toward the right is opposite the proper height of wires (shown as 25 ft. in illustration). The moment for that condition is to be found for any grade of construction on the lower scale opposite the proper span length. The illustration shows a moment of about 3,900 lb.-ft. for one No. 6 solid copper conductor 25 ft. above the ground, 200-ft. span, and Grade B construction. If three conductors are carried, the total moment due to wind pressure on conductors would be 11,700 lb.-ft.

To determine the moment on the pole, set the arrow on the handle opposite the arrow marked "Pole Moments," and rotate the lower disk until the arrow shown at the upper left side of the computer is opposite the proper pole heights as determined by its over-all length. The moment due to wind pressure on the pole will be read opposite the figure on the lower disk representing the pole diameter. The diameter of the pole one-third the distance from the top is to be used in the calculations. Approximate results would be obtained, of course, by using the average diameter. Assuming the top diameter to be 6 in. and assuming normal taper, the total moment would be about 13,100 lb.-ft., which calls for a Western red-cedar pole 27 in. in circumference at the ground line. The size of the pole is shown opposite the figures indicating total moments.

To Determine the Load That Can Be Supported by a Given Pole.—Assume that a 30-ft., 6-in.-top Western red-cedar pole, 27 in. in circumference at the ground line, is to be used to support four No. 6 solid bare-copper conductors. The pole moment as explained before is found to be about 1,400 lb.-ft. The total resisting moment of a pole 27 in. in circumference at the ground line is about 13,000. Substracting 1,400 from 13,000 leaves about 11,600, which is the permissible moment on the conductors. Assuming four conductors to be carried, this allows a permissible moment of 2,900 per conductor. If the conductors are to be 25 ft. above the ground, the computer shows that a span length of about 150 ft. is permissible, or if the conductors may be dropped down 2 ft. on the pole so as to be 23 ft. above the ground, a span of 162 ft. is permissible. This process, of course, is practically the reverse of that given before and may be used in determining the value of any variable when the others are given.

TABLE II — MULTIPLYING FACTORS TO APPLY TO CIRCUMFERENCE OBTAINED FROM TABLE I WHEN ALLOWABLE FIBER STRESS, GRADE OF POLE, WIND PRESSURE AND LOADING DIFFER FROM ASSUMPTIONS OUTLINED IN TABLE I

An allowable fiber stress of 3,250 lb. per square inch has been assumed for "dense" Southern yellow pine which has not less than one-third summer wood and not less than six annual growth rings per inch as measured over the outer 2 in. of the radius of the butt end of the pole, or if the number of rings per inch is less than six, the proportion of summer wood must be not less than one-half.

Kind of Poles	Allowable Fiber Stress (Lb./Sq.In.)	Grade	Wind Pressure (Lb./Sq.Ft.)	Heavy Loading	Medium Loading (⅔ Heavy)	Light Loading (⅓ Medium)
Chestnut	2,500	A	12	1.14	1.00	0.87
		B	8	1.00	0.87	0.76
		C	5½	0.87	0.76	0.67
		D	8	1.00	0.87	0.76
		E	5½	0.87	0.76	0.67
Cypress	2,500	A	12	1.14	1.00	0.87
		B	8	1.00	0.87	0.76
		C	5½	0.87	0.76	0.67
		D	8	1.00	0.87	0.76
		E	5½	0.87	0.76	0.67
Eastern white cedar or Northern white cedar	1,800	A	12	1.28	1.12	0.97
		B	8	1.12	0.97	0.85
		C	5½	0.97	0.85	0.74
		D	8	1.12	0.97	0.85
		E	5½	0.97	0.85	0.74
Southern yellow pine	2,500	A	12	1.14	1.00	0.87
		B	8	1.00	0.87	0.76
		C	5½	0.87	0.76	0.67
		D	8	1.00	0.87	0.76
		E	5½	0.87	0.76	0.67
Southern yellow pine (dense)	3,250	A	12	1.05	0.92	0.80
		B	8	0.92	0.80	0.70
		C	5½	0.80	0.70	0.61
		D	8	0.92	0.80	0.70
		E	5½	0.80	0.70	0.61
Western red cedar	2,500	A	12	1.14	1.00	0.87
		B	8	1.00	0.87	0.76
		C	5½	0.87	0.76	0.67
		D	8	1.00	0.87	0.76
		E	5½	0.87	0.76	0.67

This would require a 43.3-in. pole, which corresponds very closely with the 43.7 value arrived at above.

To facilitate computation, cubes of numbers from 20 to 60 inclusive (accurate to nearest 100) are shown in Table III.

TABLE III—CUBES OF NUMBERS

C	C^3	C	C^3	C	C^3	C	C^3
20	8,000	...	.....	...	.....	...	.....
21	9,200	31	29,800	41	68,900	51	132,600
22	10,600	32	32,800	42	74,100	52	140,600
23	12,200	33	35,900	47	79,500	53	148,900
24	13,800	34	39,300	44	85,200	54	157,500
25	15,600	35	42,900	45	91,100	55	166,400
26	17,600	36	46,700	46	97,300	56	175,600
27	19,700	37	50,700	47	103,800	57	185,200
28	22,000	38	54,900	48	110,600	58	195,100
29	24,400	39	59,300	49	117,600	59	205,400
30	27,000	40	64,000	50	125,000	60	216,000

If one condition of loading assumed in the above illustration calls for a 32-in. pole and another condition calls for a 37-in. pole, add the cubes of these numbers, 32,800 and 50,700. The sum of these is 83,500, which is approximately the cube of 44, the size of the pole required. This rule may give a pole slightly larger than necessary (though probably not more than 1 in. too large) because the rule is based on a principle which includes the moment due to wind pressure on the pole for each different pole size read from the table.

The rule above stated may equally well be applied to more than two conditions of loading.

CONCLUSIONS

It must be understood that the primary purpose of the table is to provide without calculation a means of determining the proper size of poles to conform to the requirements of the Bureau of Standards and of most regulatory bodies. Its purpose is to prevent too weak construction rather than too strong. The table shows that in some cases very small poles will provide the necessary initial strength. However, engineering economy or possible growth of the system may dictate the use of a larger pole.

In the past, when poles were bought on top sizes and Northern white cedar poles were being used, very little trouble was experienced with pole sizes, because very few companies bought poles with less than 5-in. or 6-in. tops and these were generally large enough at the butt. The trouble came, however, when poles of smaller taper, such as Western red cedar poles, came into use. Construction men have said that it is sometimes necessary to apply a tape to the poles to determine which end should go into the ground. Measurements of Western red cedar poles as made by the Western Red Cedar Association show that a number of 30-ft. poles having approximately 6-in. tops have not more than 7-in. or 8-in. diameter at the ground line. Thus the use of the small, tapered type of pole calls for a closer check of strength elements and perhaps a departure in the use of top sizes as the chief method for selecting poles for strength.

REPLACEMENTS ON STRENGTH BASIS

The National Electrical Safety Code provides that wooden poles should be replaced or reinforced when their strength has decreased to two-thirds that required for new installations of Grades A and B construction and to one-half for Grade C construction. Since about ½-in. rot around a pole 8 in. in diameter at the ground line will decrease the strength of the pole to the required replacement strength, it is apparent from an economical point of view that it might not be practicable to set such a pole even though it might provide the necessary initial strength. The smaller pole, especially if untreated or poorly treated, may need replacement in a very few years. Care should be taken, therefore, to provide against setting poles which are too small, although of sufficient strength initially.

Consideration must also be given to top sizes, particularly in the case of poles with a large amount of taper. A pole having a ground-line circumference sufficient to provide the necessary strength might be too small at the top to be suitable for use. The additional load that lines may be called upon to carry during their life must also be taken into account.

A Correction in the Lamp Committee's Report

A TYPOGRAPHICAL error in the report of the lamp committee (N. E. L. A. Publication No. 24-53, page 1, twelfth line of text) made it appear that 1923 sales of tungsten-filament incandescent lamps increased 2½ per cent over 1922. The increase should have been stated as 21½ per cent.

The White Motor Company Improves Illumination

How an Engineering Investigation Recommended 4,957 Outlets, Raising the Average Intensity to 12 Foot-Candles—New-Type Reflector Partly Lights Ceiling—More than 1,800 Units Installed

By HENRY HYLKEMA* and H. T. SPAULDING†

FOR the purpose of assisting its workmen in adhering to closer working limits the White Motor Company of Cleveland is now engaged in a large lighting rehabilitation program involving the installation of 4,957 outlets, which will raise the lighting intensity from the old average of 6 foot-candles to a uniformity of 12 foot-candles. The installation was half completed in March, 1924, and is one of the largest relighting programs in the country. When about a year and a half ago requests for individual lighting units were received from the men, an investigation was made which showed that the reason for these requests was the closer working limits laid down by the engineering department. In other words, the men wanted better light at the working points in order to turn out the finer work required. Since these requests were numerous, the management decided to look into the shop lighting before any large expenditures were made.

FIG. 1—BEFORE INSTALLING THE "GLASSTEEL" DIFFUSERS, SHOWING THE SHADOWS

FIG. 2—AFTER INSTALLING "GLASSTEEL" UNITS AN INTENSITY OF 12 FOOT-CANDLES WAS OBTAINED

The factory buildings were of sawtooth construction and illumination was obtained from three sources: first, daylight through the sawtooth roof; second, the general lighting units; third, individual lighting units at the working points. During the day the illumination was fairly good but with a varied intensity. This intensity was also lowered by the kind of work done in that department and the condition of the walls. Oil thrown by belts in the machine shops greatly lowered the lighting efficiency. The light was of the greatest intensity in those departments where the work handled was clean and where the buildings had been recently constructed. The old lighting equipment (Fig. 1) consisted of overhead lamps of from 100-watt to 200-watt capacity equipped with solid-dome reflectors spaced every 15 ft. to 20 ft. These had been installed so as to be easily removable both as to location and as to mounting heights. At certain places individual lamps were mounted on adjustable brackets fastened to the machines. This fact in itself was an indication that the main basic lighting itself had not been rightly developed, since the brackets were always in the way and the units either gave too much light in one spot or were glaring to the other workmen.

PAINTING IMPROVES LIGHTING SLIGHTLY

It was thought best at first to repaint the entire factory. This work was started in January, 1922, and took about seven months to finish. All the walls and ceilings were first cleaned and then painted white. This paint has now been on about a year and will be renewed every two or three years in order to maintain the standard of illumination decided upon.

But after repainting the factory it was found that the lighting was still insufficient in the early mornings or on dark days. The management then decided upon an exhaustive investigation of the entire lighting problem. For assistance in this the engineers of the Cleveland Electric Illuminating Company and the lighting experts of the National Lamp Works of the General Electric Company were called upon. A preliminary

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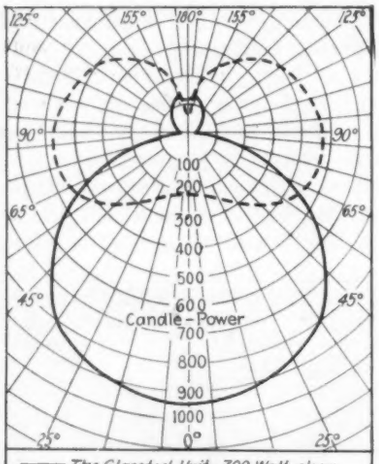
†Industrial lighting specialist, Nela Park, Cleveland.

survey of several locations in different departments indicated that the intensities of illumination, which varied from 3 to 10 foot-candles (Table I) were somewhat lower than might be required in modern factories. There was also a marked degree of non-uniformity of illumination. In studying the requirements of improved lighting for a plant of this size, ranging over thirty acres, so many conditions and factors had to be considered that each department was handled as a separate unit. This was done for the reason that no set solution could ever be expected to provide adequate illumination for the different kinds of work in the various departments.

The engineers reported after investigating twenty-five buildings that the most serious difficulties seemed to lie in the following faults of the old system: First, there was not enough light; second, the spacing was too great to provide uniform illumination; third, the direct glare due to the use of clear glass in the unshaded overhead units and the reflected glare from the machines and work were extremely annoying; fourth, the use of local lighting, while it provided a satisfactory amount of illumination for the machine upon which the lamp was placed, introduced very bad conditions of reflected glare.



Zone	Lumens	% Total clear Lamp
0 - 60	2265	46
0 - 90	2924	60
90 - 180	340	7
0 - 180	3264	67

FIG. 3—A DISTRIBUTION CURVE FOR A 300-WATT "MAZDA C" LAMP IN A "GLASSTEEL" DIFFUSER ALLOWING 7 PER CENT OF THE LIGHT TO BE DIRECTED TOWARD THE CEILING

In making this investigation the engineers took into consideration five principal points in the selection of a satisfactory lighting system, namely:

1. The proper quality of light.
2. Elimination of direct glare.
3. Elimination of short, direct shadows.
4. Psychological effect upon workmen of an attractive plant.
5. An installation which is flexible and easily maintained.

The subject of proper quality of light is directly dependent upon the requirements of the work itself. Closely gaged work requires a strong lighting intensity. For ordinary operation such as is found in this plant where fine machine work is necessary an intensity of from 8 to 14 foot-candles was considered desirable in order that work might be done efficiently.

The second point regarding the elimination of direct glare was a very serious one. The modern incandescent lamps have a brightness so great that when viewed "full on" they have a blinding effect which persists for an appreciable time thereafter. They may also interfere with the ability of a workman to carry on his operations and often result in accidents. Furthermore, if obliged to work under conditions of glare, his eyes will in time become weakened to an extent where their sight is actually impaired. Reflected glare, or an image of light sources reflected from polished portions of the machines, is fully as serious as direct glare, particularly since this glare is always in the direct view of the workman.

The third point, as to sharp, distinct shadows, is of vital importance where close working limits are required. While a certain amount of shadow is desirable, this shadow should not be too sharply defined nor should it be very dense.

Regarding the fourth point, the question of appearance has a tremendous psychological effect upon workmen. No human being enjoys working for long periods in shadowy places. It is therefore desirable that the upper portion of the room receive some light so that there will be no depressing effect such as normally arises if the upper level of the room is in entire darkness. Ordinarily a small portion of light will be reflected back to this area by the floor and machinery, but it is desirable to increase this light by providing an upward component from the lighting unit itself.

From a maintenance standpoint the fifth factor requires a system easily cleaned. Unless lighting units are accessible and are washed at regular intervals, the lighting intensities are materially reduced because of the dust and dirt arising from the operating machines.

TABLE I—FOOT-CANDLE READINGS AT VARIOUS LOCATIONS WITH FORMER INSTALLATIONS

At no place did the intensity exceed 10 foot-candles.

Automatic screw machine at work:	a*	b	c	d	e	f	g	h				
Foot-candles	7	2	3	7	2.5	6	3	5				
Aisle:					a	b	c					
Foot-candles					1.5	2	2.5					
Gear cutting:	a	b	c	d	e	f	g	h	i	j	k	
Foot-candles	5	7	5	2	10	3.5	7	8	3	8	4	
Grinding at the wheel:		a	b	c	d	e	f	g	h	i	j	
Foot-candles		7	6	6	9	3	7	5	7	6	5	
Engine-block test:									a			
Foot-candles									8 to 12			
Erecting shop:												
Upper level of work:					a	b	c	d	e	f		
Foot-candles					10	15	10	11	9	10		
Lower level of work (partly shaded):									a	b		
Foot-candles									2	3		
Machine shop:	a	b	c	d	e	f	g	h	i	j	k	l
Foot-candles	8	5	3	4	3	2	6	10	2	7	6	2
Local individual lighting:												
Foot-candles	15 to about 40†											

* The letters indicate arbitrary locations for readings. † Depending upon adjustment of local units.

TABLE II—RECOMMENDED AND INSTALLED CHANGES FOR TWENTY-FIVE BUILDINGS TO USE "GLASSTEEL" REFLECTOR UNIT

All on 10-ft. x 10-ft. spacings

Building	Class of Work	Diffusers Installed	Diffusers Contemplated
4	Heat treating	.....	34
5	Machining axles	312	.....
6	Gear cutting	154	143
9	Tool and machine shop	604	.....
13	Machining and storing	.....	510
14	Screw machines	477	.....
19	Repair department	177	.....
20	Heat treating	.....	21
21 and 21½	Machining and assembling, block testing	.....	586
22	Sheet-metal working	.....	299
22½	Inspection	.....	146
23	Erection-frame fitting	.....	792
24	Assembling, painting	.....	557
25	Garage and testing	145	.....
	Total	1,869	3,088
	Grand total for plant		4,957

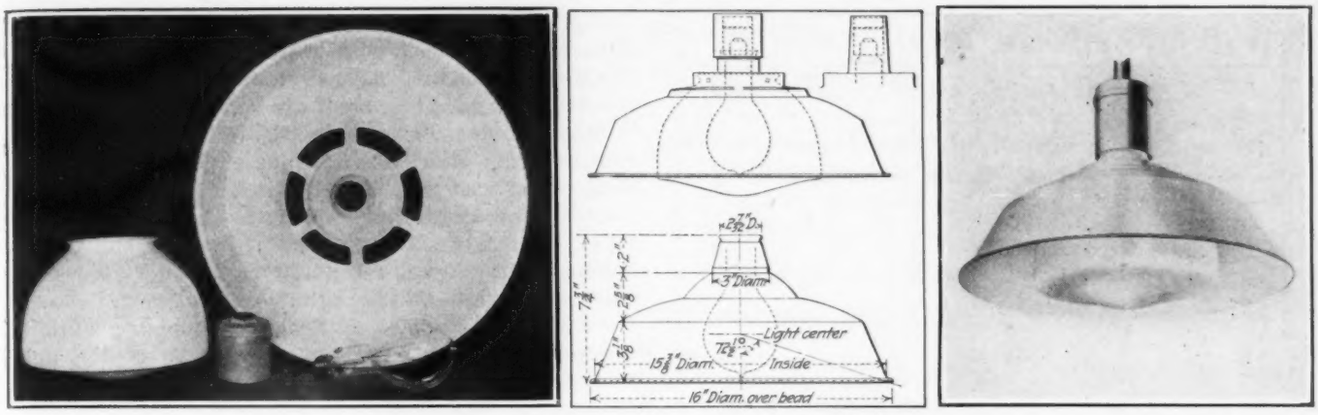


FIG. 4—AT RIGHT, THE NEW "GLASSTEEL" DIFFUSER WITH A "MOGUL" BASE ASSEMBLED; IN CENTER, CROSS-SECTION OF ASSEMBLED UNIT; AT LEFT, ITS COMPONENT PARTS

By completely inclosing the lamp the brightness is reduced to a value of 3 cp. to 5 cp. per square inch. The total light output of either the "R. L. M." dome and bowl-enameled lamp combination or the "Glassteel" diffuser is slightly better than 65 per cent.

This reduction in intensity due to dirty lamps may be as much as 40 per cent.

Therefore, basing their findings on these factors, the engineers after a thorough survey drafted tentative specifications recommending "Glassteel" units with 200-watt lamps as listed in Table II, totaling 4,957 outlets. An average intensity of 12 foot-candles was desired. The spacing was recommended to be 10 ft. x 10 ft. with a mounting height of 10 ft., since the type of machine work carried on in the White Motor Company plant called for nothing less than productive intensity lighting in full accordance with modern illumination standards.

To acquaint the representatives of the White Motor Company with modern tendencies in illumination for industrial interiors, previous to their final decisions on the project of relighting, inspection trips were arranged for them in several plants at Cleveland and Detroit. The investigations were conducted in a thorough manner, and various types of systems were studied. After the survey the company officials made known their desire to adopt the recommended system and approved both the design of the system and the use of the "Glassteel" unit.

Since the specifications called for the expenditure of a large amount of money to install 4,957 outlets, the company decided to begin with a conservative trial installation. The gear-cutting department, which occupied nearly a whole building, was first selected and the installation of 154 units made. After a few weeks' test of the system, orders were issued by the company to complete the installation of other departments, and quarterly appropriations will ultimately bring about the complete relighting of the plant. The number of

FIG. 5—WITH A MOUNTING HEIGHT OF 12 FT., THE "GLASSTEEL" 300-WATT UNITS PRESENT A CLEAR, DIFFUSED ILLUMINATION THROUGHOUT THE ENTIRE ROOM

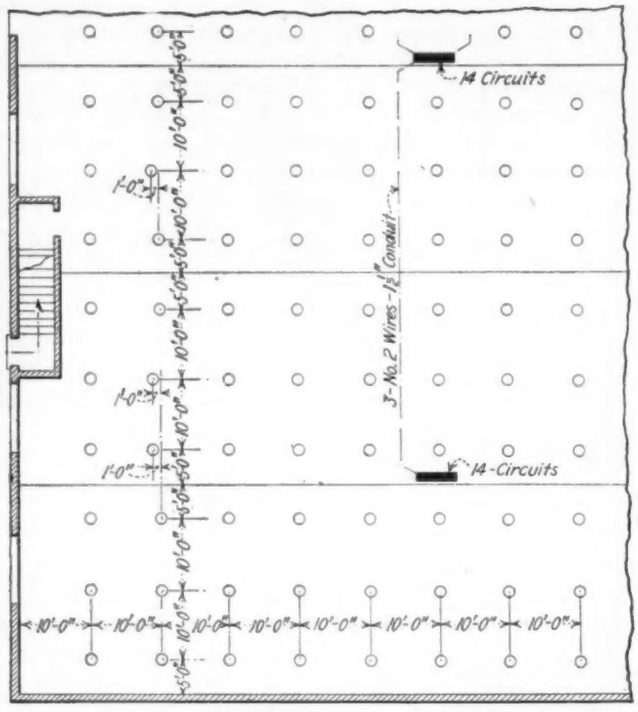


FIG. 6—TYPICAL OUTLET LOCATION FOR THE VARIOUS DEPARTMENTS ON 10-FT. X 10-FT. CENTERS TO GIVE AN INTENSITY OF 12 FOOT-CANDLES

"Glassteel" units installed up to March 15, 1924, was 1,869. Just how close the theory of the layout checks with the actual results may be found from the tests recorded in Table III, which were given for various positions in the gear-cutting department.

The "Glassteel" reflector was especially adopted for the gear-cutting room because of its good diffusion upon the index heads and various scales on the automatic machine. Since these indexes are either engraved or polished metal on both vertical and horizontal planes, special care had to be given to the choice of a lighting source for such work. But the new "Glassteel" unit offers the best solution now available because reflected glare from bright surfaces is partially eliminated.

The "Glassteel" unit was recommended and adopted in order to secure better diffusion and also to permit light to reach the upper part of the room. The "RLM" unit was specified at first, but the results from the "Glassteel" unit were thought better. The flux distribution of a "Glassteel" unit is given in Fig. 3 and details of the lamp itself are shown in Fig. 4. This "Glassteel" unit consists of a glass diffusing globe surrounding the lamp itself, while a porcelain-enameled steel reflector of the "RLM" standard-dome shape surrounds the entire unit. It really is a grown-up "RLM" unit. The 18-in. unit has a 2¼-in. neck to take a medium-screw socket for a 100-watt, 150-watt or 200-watt lamp, while the 20-in. unit uses a "mogul" socket for a 300-watt or 500-watt lamp. The upper portion of the reflector is cut away to allow some of the light to reach the ceiling and to be generally diffused from that source, thus tending to reduce direct and reflected glare and also troublesome shadows. These advantages outbalance the higher cost, some possible increased cleaning labor and a greater loss through breakage. A comparison of the "RLM" and "Glassteel" types is made in Table IV.

TABLE III—NEW INTENSITIES IN GEAR-CUTTING DEPARTMENT IN VARIOUS POSITIONS

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
8	11	10	8	10	11	11	9	15	10	11	12	13	12	12

LOCAL LIGHTING UNNECESSARY

This recommended installation did obviate the necessity of local lighting in practically all portions of the plant, because of the high intensities on practically all operating planes. In a few instances, such as with large punch presses and for internal boring operations, it was found necessary to provide additional local lighting. With intensities as high as this little difficulty was experienced by the men operating the machines from any angle or plane of vision. The engineers recommended that the overhead lighting alone should have a trial first, after which a survey should be made to determine in just what location local lighting was absolutely essential. The past year's use of the equipment has shown that only a few local lights will be needed in a few isolated cases. The equipment for this purpose is a standard shallow-metal reflector suitable for use with a 50-watt mill-type lamp.

Since the initial foot-candle rating for the system when new was 15, the level of illumination can with ordinary maintenance be kept fairly high, sufficient for the present needs of the plant. In order to get the best results from the equipment under service conditions, it was considered most economical to plan definitely for lamp renewals and the removal of dust and dirt. Two men now compose the cleaning gang, although their entire time is not devoted strictly to cleaning the fixtures. A definite schedule for monthly cleaning is now in effect. A benefit was discovered after the system had been installed which had not been

TABLE IV—COMPARISON OF CHARACTERISTICS AND QUALITIES OF "RLM" REFLECTOR WITH BOWL-ENAMELED LAMP AND "GLASSTEEL" DIFFUSER

(Prepared by engineers in White Motor Company plant analysis)

		"RLM" Dome Bowl-Enameled Lamp	"Glassteel" Diffuser	Remarks
1	Illumination on horizontal	A—	B+	"Glassteel" diffuser gives 5 to 10 per cent less illumination; in large rooms with light ceilings 5 per cent; in smaller rooms with dark ceilings, 10 per cent
2	Illumination on vertical	B	B	More light is diffused at higher angles by the "Glassteel" diffuser
3	Favorable appearance of lighted room	B	A—	The use of the "Glassteel" diffuser gives lighter ceilings and upper side walls
4	Direct glare	B+	A—	With the "Glassteel" diffuser the background is better illuminated, hence the contrasts are not so severe; also the brightness of the globe of the "Glassteel" diffuser is 3 cp. to 6 cp. per square inch. The brightness of the bowl-enameled lamp in an "RLM" dome is 12 cp. to 18 cp. per square inch
5	Reflected glare	B	B+	The reflected image of the "Glassteel" diffuser in a shiny metal plate is about one-third as bright as the image of a bowl-enameled lamp
6	Shadows	B+	A—	The shadows are softer with "Glassteel" diffuser (1) because of large diameter of evenly luminous light source, (2) the light from distant fixtures illumines shadows
7	Maintenance	A—	B+	"Glassteel" diffuser has an extra glass part to clean; however, it does not require a bowl-enameled lamp
8	First cost	....	....	Cost of "Glassteel" diffuser is about double that of the "RLM" dome

thought of before. Lamp thefts were found to be very much fewer because of the globe inclosing the unit.

In making the recommended changes it was strongly advised that the installation be made permanently in conduit with no allowance for adjustment of the location and height of lighting unit. The old system was criticised for the reason that the units were clamped to the beams and supplied with current by flexible cords extending to distribution panels in the upper part of the room. While this old system had the advantage of flexibility, its appearance and lighting effectiveness were materially reduced when these units were moved about because necessary changes in manufacturing operations required other locations and mounting heights. Accordingly it was thought that the most satisfactory installation would be one constructed of rigid conduit from an outlet box to the lamp socket. This construction work was done on a cost-plus basis with an average charge per outlet of $15.50, which includes the wiring, switching and fixtures complete. About half of this went for the wiring and labor.

DESIGNING LAYOUT DIFFICULT

In the actual design layout work the first step was a study of the symmetrical arrangement of outlets with respect to the interference with belts and countershafts, shadows cast by belts, absorption of light, vibration and difficult cleaning of reflectors. Fortunately the standard sawtooth building forms helped to maintain the symmetry of outlets (Fig. 5). The belts and countershafts were found to be particularly troublesome because of the great variety of machine tools located with regard to the floor space and the efficient handling of materials. There also appeared to be no uniformity of location for the countershafts. These outlets were included in plan drawings of all the buildings, as in Fig. 6. The drawings were then taken out into the shop and each outlet location was inspected to see if any object might interfere. In case of interference a new location was indicated on the print, giving exact dimensions. The job of the designing department was the fitting of the equipment into the buildings so as to avoid obstruction and interference as far as possible. This was largely a matter of "cut and try." However, very few outlets had to be displaced. At the most, the spacing was changed only to 10 ft. x 12 ft. as against the standard 10 ft. x 10 ft. Flexibility of control was provided by placing switches in such a way as to provide lighting on either 10-ft. x 10-ft., 10-ft. x 20-ft. or 20-ft. x 20-ft. centers.

The improvement in shop lighting has been considered valuable by the White Motor Company from a production standpoint, as a safety precaution and as a means for better manufacturing through increased output, reduced spoilage and higher-grade workmanship. From a humanitarian standpoint, the investment has increased satisfaction among the employees. While the benefits of enhanced morale are not the only ones to be obtained, the attitude of the employees clearly reflects their appreciation of the change. Persistent interest and approval are evidenced by queries from the men in the departments not yet relighted as to when they will be able to have "daylight" in their shops.

The authors wish to express their appreciation of the services rendered by R. A. Fulton of the Cleveland Electric Illuminating Company in helping to improve the illumination of this plant.

Wider Margin of Profit Needed on Electrical Appliances

Many Central Stations Incur Merchandising Loss and Small Dealers Do Not Prosper—Potential Market $500 per Home

BY JOHN F. GILCHRIST
Vice-President Commonwealth Edison Company, Chicago

THE "high points" of Mr. Gilchrist's address on "Merchandising Responsibilities" before the Accounting Section at the N. E. L. A. convention in Atlantic City were set forth on page 1074 of the *Electrical World* for May 24. Because the principles which he advocated are of industrywide interest in the solution of the problem of the more rapid sale of electrical appliances at a fair profit, Mr. Gilchrist's address has been abstracted at length.

IT IS only within very recent years that anything approaching a careful survey and study had been made of the conditions under which electrically operated domestic appliances are being distributed and the possibilities of the business. An outstanding feature of the growth has been, and to a great extent still is, the disposition of the utilities to place appliances on their lines as load builders, giving no thought to any very well-defined merchandising policy, the statement even now being occasionally made that there is no reason why the utilities should desire to make a merchandise profit on these articles—that the proper plan is to sell them at cost or even below cost. Manufacturers, understanding that the utility operators did not care to make a profit, established prices on their goods and advertised these prices widely on a basis which would not permit giving a price to the utility or dealer which would insure a fair profit.

The bad effects of this policy were not discovered until operators began to realize that the best way to get a wide distribution of these appliances quickly was to sell them on a basis which would yield a reasonable profit when appliance selling was considered as an independent business. A survey indicated that under present conditions such a business could be done only in cases where the sale of appliances was carried on as a side issue to a larger business. In other words, it is impossible for the average business man, under average conditions, to establish a business exclusively devoted to the sale of electrical appliances and make a "go" of it.

POTENTIAL MARKET $5,000,000,000

Here is a situation where there are ten million dwelling places electrically equipped each of which is a potential market for the sale of at least $500 worth of useful labor-saving electrical appliances, an aggregate of five billion dollars of business, and the utilities and manufacturers that are most interested are letting this business drift along in a condition under which, with the education, demonstration and servicing required in the sale of these articles—constituting an expense in excess of the expenses of the ordinary business—the independent dealer cannot buy the goods cheaply enough to allow him to sell them at the advertised price of the manufacturer and pay his expenses without experiencing a heavy loss. This unfortunate situation throws the

responsibility of seeing that the people have the benefit of these labor-saving devices most squarely upon the shoulders of the utility companies.

No survey is available, as far as I know, of the value of the average number of these devices in the homes of a typical utility community at the present time, but, in view of the fact that, with a few exceptions, the utilities which are most aggressively exploiting the sale of such appliances are not selling more than $10 worth per residence customer per annum, it is fair to assume that an exceedingly small percentage of homes are completely equipped with the devices which should be in every home today. If the market was as good as it should be, there would be made annually in every community sales aggregating $30 or $40 or $50 per electricity-using residence. In communities where there are 25,000 residence customers there should be annual sales, say, of $1,000,000 worth of these appliances. In communities where there are 250,000 residence customers there should be at least $10,000,000 of these sales.

One large company where rates have been considerably reduced in the past ten years shows that in that period the average monthly bill per residence meter has gone up from 30 cents to 35 cents per month, or from an average of $1.85 per month per meter ten years ago to an average of $2.20 per month per meter at the present time. The number of meters in that company's territory having increased fivefold in the meantime. It is probably fair to assume that a considerable part of this increase is due to the use of appliances, and this notwithstanding the fact that so little headway has been made in placing electrical appliances in the homes.

Therefore, I think it would be conservative to estimate that, if the appliances which, from the standpoint of economy, should be used in every home were in fairly general use, the average bill for electricity would be at least $2 per month more than it is at present. It would probably mean an increase of nearly 100 per cent in revenue from residences, or an increase in total income from all sources of at least 20 per cent to the great majority of companies.

WHAT HINDERS DEVELOPMENT

The question which naturally arises is, what is hindering the building up of a large business in the field described, and what should our policy be? In the first place, the utilities should themselves sell household appliances and push the sale of them most aggressively, using all the honorable and dignified methods which have been found effective in the merchandising of comparable non-electrical household furniture and devices, the limitation being that the business should be done at a reasonable merchandising profit when considered as an absolutely independent undertaking.

Second, the business should be done in such a way that well managed and financed independent concerns may readily compete and secure a portion of the community's business on a profitable basis and thus build up strong and resourceful institutions engaged entirely and exclusively in the sale of electrical appliances.

In view of the fact that no business will be found susceptible of wide and healthy expansion unless there is enough margin between the cost of manufacture and the price which the ultimate consumer pays properly to defray all of the necessary expenses incident to widespread distribution and sale, and to insure a reasonable profit to compensate the brains, energy and money which is essential to the task, and in view of the fact that such a condition does not exist today in the business of merchandising electrical household appliances, steps should be taken to bring about healthier conditions.

For more than a year the figures of the departments devoted to the merchandising of appliances in eleven or twelve of the utilities have been analyzed and tabulated.* In the first place, I think I am correct in stating that the company which does the very smallest business, both in volume and in business per customer or inhabitant, makes the largest profit, and the company which does the largest business makes almost the largest loss. It should be borne in mind that these figures were got up, not for the purpose of showing what these businesses really made or lost, but for the purpose of making as close an estimate as is possible of what they would have made or lost had they been run as independent businesses, with the necessity of performing all functions for themselves.

BUSINESS CANNOT THRIVE WITHOUT PROFIT

I feel that this very important branch of our business is being greatly retarded by the condition which I have indicated. I think every one is convinced that a business will not thrive unless there is enough in it fairly to compensate the manufacturer, the jobber and the dealer for their cost and leave them a reasonable profit; otherwise the business will be a "lame duck." Electrical merchandising is a business which involves more expense than the average merchandising operation. People have to be educated to the value of the appliances. The appliances must be demonstrated to them, and, finally a certain amount of servicing must be furnished in order that the apparatus may properly perform its functions until such time as the purchaser has become sufficiently familiar with it to give it the right kind of attention.

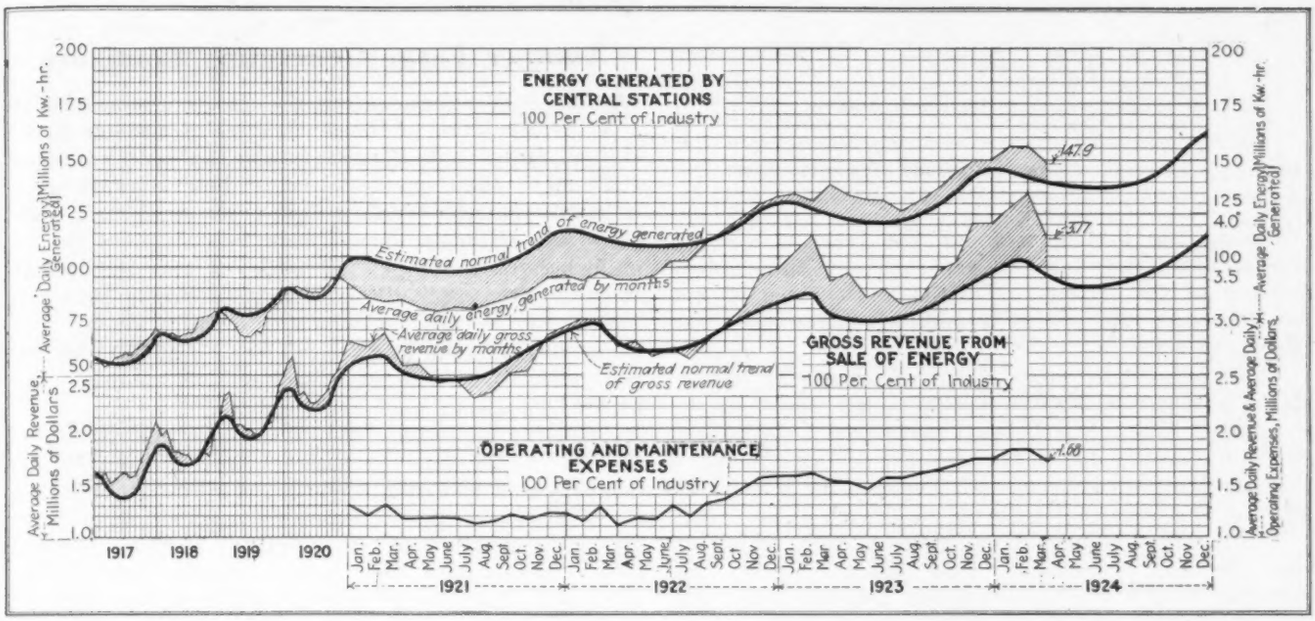
We have found that independents cannot succeed in a business consisting exclusively of the sale of appliances, and, in my judgment, the interests of everybody in the business dictate that we should get at the bottom of this affair and find out whether anybody could really make any money in this as an independent business, and in this effort I think that we are very much hampered by the natural disinclination of merchants to admit that they are losing money or to convince themselves that they are.

If we are content to let the business grow as it normally will, with just a reasonable amount of advertising and no activity or outside solicitation, any more than would be given by a department store, the set-up of prices is probably all right as it is and the business will have a slow but sure growth. I am sure, however, that any one who makes a very careful study of the entire situation will finally reach the conclusion that such a policy of slow growth is not the proper policy.

What we must accomplish as a result of this showing is either to have the manufacturers abandon entirely their present practice of establishing and advertising the retail price, which is the situation in almost all older branches of merchandising, or, better yet, to establish a retail price high enough to let the discount given to the dealer leave a margin on goods sold at the retail price sufficient to give him a reasonable profit.

*The merchandising accounting committee's report, with tabulation showing comparative statement from eleven companies and composite curve of expenses, net sales, gross profit and a net over-all loss of 4.4 per cent, was abstracted on page 1072 of the ELECTRICAL WORLD for May 24.

March Operations 6.4 per Cent Above Normal



THE economic depression in industry in general was reflected in the central-station returns for March. Reports received by the ELECTRICAL WORLD from electric generating and distributing companies representing 74 per cent of the installed generator rating of the country indicate that the energy consumed by power customers during March was 135,523,000-kw.-hr. under that consumed by such customers during January, a month of the same number of days. Last year the energy consumed by power customers during March was slightly greater than that consumed during January. Every section of the country except the Mountain and Pacific States reported decreased energy consumption by power customers. Even with this curtailment in industrial requirements, the amount of energy consumed by power customers in March was 3.1 per cent above that consumed in March, 1923. What proportion of this increase was due to new power customers taken on during the twelve-month period is uncertain.

On the other hand, the energy required to supply the lighting demands of the country showed a growth of 15.4 per cent over March of last year. The total amount of energy generated by the central stations during the month was 5.9 per cent in excess of that generated in March, 1923. A study of the accompanying diagram indicates that the energy generated by the central stations during March was about 6.4 per cent above what it would have been if the energy requirements of the country had been normal. In an effort to obtain conformity in the statistics of the industry the data on energy generated have been revised to conform with the data as given out by the U. S. Geological Survey.

TABLE I—GENERATION AND DISTRIBUTION OF CENTRAL-STATION ENERGY IN THE UNITED STATES
(100 per Cent of the Industry)

Mos.	Kw.-Hr. Generated Monthly			Distribution of Energy Generated										Kw.-Hr. Purchased for Resale	
				Total Energy Consumption by Central-Station Customers, Kw.-Hr.		Energy Consumed for Lighting Kw.-Hr.		Energy Consumed for Power Kw.-Hr.		Energy Sold to Electric Railways Kw.-Hr.		Energy Used in Intra-Company Business Including Line Losses, Kw.-Hr.			
	1924 Thousands	1923 Thousands	Per Cent Inc.	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands
January	4,792,704	4,357,066	10.0	3,867,704	3,517,066	820,000	711,000	2,525,004	2,314,566	522,700	491,500	925,000	840,000	819,000	633,000
February	4,465,858	3,966,278	12.2	3,604,858	3,201,278	733,000	635,000	2,381,858	2,122,278	490,000	444,000	861,000	765,000	735,000	582,500
March	*4,586,181	4,331,204	5.9	3,700,181	3,494,204	788,000	683,000	2,389,481	2,319,704	522,700	491,500	886,000	837,000	772,600	622,000

* Data on "energy generated" is that collected and published by the U. S. Geological Survey for all public utilities, minus such data as is collected on energy generated by electric railway companies, reclamation service and manufacturing plants.

TABLE II—CENTRAL-STATION FINANCIAL OPERATIONS FOR THREE MONTHS IN THE UNITED STATES
(100 per Cent of the Industry)

Mos.	Gross Revenue from Sale of Energy†			Operating and Maintenance Expenses‡			Operating Ratio					
							Steam Plants		Hydro Plants		Combined Steam and Hydro Plants	
	1924 Thousands	1923 Thousands	Per Cent Increase	1924 Thousands	1923 Thousands	Per Cent Increase	1924	1923	1924	1923	1924	1923
January	126,970	114,440	11.0	57,670	50,950	13.2	47.0*	47.3	24.6	23.8	43.0	45.3
February	122,760	108,500	13.2	53,303	46,483	14.8	46.1	46.7	29.6	28.8	43.7	45.3
March	118,010	106,310	11.0	54,050	49,000	10.3	48.6	51.3	28.6	26.5	46.2	44.7

† Aggregate gross revenue from actual consumers and sales to other public utilities for resale, involving a certain amount of duplication.
‡ Do not include interest, taxes, depreciation or sinking fund.

TABLE III—OPERATIONS OF CENTRAL STATION HYDRO AND FUEL POWER PLANTS IN THE UNITED STATES
(100 per Cent of the Industry)

Mos.	Energy Genera ted		Fuel Consumption		
	Hydro Plants (Thousands of Kw.-Hr.)	Fuel Power Plants (Thousands of Kw.-Hr.)	Coal (Short Tons)	Oil (Barrels)	Gas (Thousands of Cubic Feet)
1924					
*March.....	1,689,289	2,896,892	2,604,460	1,499,072	3,173,392

During the first quarter of the year a total of 13,844,743,000 kw.-hr. was generated by the central stations of the country. This is an increase of 9.4 per cent over the energy generated during the first quarter of 1923.

The average daily gross revenue from sale of energy shows a material, though not abnormal, drop under February. March has always witnessed a large decrease in revenue due to the seasonal decrease in high-revenue lighting requirements. Revenue for March was 11.0 per cent over that reported for March of last year.

A new table has been added to the monthly review of central-station operations. This tabulation gives the distribution of energy generated as between hydro and fuel plants, and also the fuel consumed by the central stations during the month. It must be remembered that these figures are for the electric light and power industry only and are therefore below the data on the same items published monthly by the United States Geological Survey.

Another Large Generating Company

A REPORT which arrived too late to be included in the tabulation of the central-station systems in the United States and Canada having an output during 1923 more than one hundred million kilowatt-hours indicates that the Western States Gas & Electric Company of California should have been in this list as published in the April 12 issue of the ELECTRICAL WORLD. The output of that company during 1923 was 114,597,745 kw.-hr., of which 38,817,660 kw.-hr. was generated by the company and 75,780,085 kw.-hr. was purchased. The peak load of this company was 24,336 kw., taking place in June, 1923.

Attention has been called to the fact that there was an error in the data reported by the New York Edison Company and United Electric Light & Power Companies of New York City, combined, in that 265,319,610 kw.-hr. included under "intracompany business and line losses" should have been included under "other public utilities." The energy sold to "other public utilities" by these combined companies during 1923 was 295,016,929 kw.-hr., and the energy used in "intracompany business and line losses" was 305,273,443 kw.-hr.

TABLE IV—CENTRAL STATION FINANCIAL OPERATIONS AND THE GENERATION AND DISTRIBUTION OF ENERGY BY SECTIONS OF THE COUNTRY FOR THE FIRST QUARTER OF 1923 AND 1924
(100 per Cent of the Industry)

Mos.	New England States			Atlantic States			North Central States			South Central States			Pacific and Mountain States		
	1924 Thousands	1923 Thousands	Per Cent Inc.	1924 Thousands	1923 Thousands	Per Cent Inc.	1924 Thousands	1923 Thousands	Per Cent Inc.	1924 Thousands	1923 Thousands	Per Cent Inc.	1924 Thousands	1923 Thousands	Per Cent Inc.
Total Energy Generated (Thousands of Kw.-hr.)															
January.....	339,297	344,707	—1.6	1,771,960	1,619,461	9.4	1,502,018	1,351,420	11.1	325,602	280,564	16.0	853,827	760,914	12.3
February.....	320,370	310,058	3.4	1,638,208	1,467,006	11.7	1,384,472	1,217,147	13.7	308,907	256,478	20.4	813,901	715,589	13.7
March.....	*310,222	327,943	—5.4	*1,678,648	1,596,875	5.2	*1,428,736	1,331,896	7.2	*312,496	281,731	11.0	*856,079	792,759	7.9
Total Energy Generated in Hydroelectric Plants (Thousands of Kw.-hr.)															
March.....	*121,033	120,451	0.4	*623,843	551,455	13.3	*222,053	222,886	0.4	*111,016	93,438	18.7	*611,344	699,317	—12.6
Total Energy Generated in Fuel Burning Plants (Thousands of Kw.-hr.)															
March.....	*189,189	207,492	—8.8	*1,054,805	1,045,420	0.9	*1,206,683	1,109,010	8.8	*201,480	188,293	7.1	*244,735	93,442	172.0
Total Energy Consumed for Lighting (Thousands of Kw.-hr.)															
January.....	77,000	66,200	16.4	241,000	204,000	18.1	313,000	274,400	14.1	75,700	63,900	18.4	113,300	102,500	10.5
February.....	68,800	59,200	16.3	215,000	182,300	18.0	280,000	244,600	14.5	67,800	57,200	18.6	101,400	91,700	10.6
March.....	74,000	63,000	17.4	231,000	196,000	17.8	301,200	264,000	14.1	72,800	61,500	18.5	109,000	98,500	10.6
Total Energy Consumed for Power (Thousands of Kw.-hr.)															
January.....	152,097	169,707	—10.4	1,031,035	956,226	7.9	755,293	667,185	13.2	137,052	118,834	15.3	449,527	402,614	11.7
February.....	147,870	152,858	—3.3	962,343	863,006	11.4	701,707	612,147	14.6	132,937	108,578	12.0	437,001	385,689	13.1
March.....	131,772	159,843	—17.6	969,723	939,840	3.2	706,111	670,061	5.4	126,446	119,301	5.9	455,429	430,659	5.8
Total Energy Sold to Electric Railways (Thousands of Kw.-hr.)															
January.....	37,200	34,600	7.5	166,925	164,735	1.4	189,925	181,035	5.0	44,650	39,530	13.0	84,000	71,600	17.3
February.....	34,800	31,400	10.8	157,365	148,900	5.8	178,565	163,500	9.2	40,770	35,500	15.0	78,500	64,700	21.4
March.....	37,200	34,600	7.5	166,925	164,735	1.4	189,925	181,035	5.0	44,650	39,530	13.0	84,000	71,600	17.3
Total Energy Used in Intra-Company Business and Line Losses (Thousands of Kw.-hr.)															
January.....	73,000	74,200	—1.6	333,000	294,500	9.4	243,800	228,800	11.1	68,200	58,300	16.0	207,000	184,200	12.3
February.....	68,900	66,600	3.4	303,500	272,800	11.7	224,200	196,900	13.7	67,400	55,200	20.4	197,000	173,500	13.7
March.....	67,250	70,500	—4.6	311,000	296,300	4.9	231,500	216,800	6.8	68,600	61,400	11.7	207,650	192,000	8.2
Total Energy Purchased for Resale (Thousands of Kw.-hr.)															
January.....	74,000	77,100	—4.0	344,600	277,200	24.3	176,000	175,800	0.2	159,100	50,800	213.0	65,300	52,100	25.5
February.....	100,000	83,200	20.2	318,000	269,200	18.2	160,800	101,800	57.9	60,500	64,050	—5.8	95,700	64,250	48.8
March.....	91,250	92,200	—0.9	325,800	273,500	18.3	171,200	128,000	33.8	70,650	59,560	18.7	113,700	68,740	65.4
Total Coal Consumption (Short tons)															
March.....	*153,892	169,756	—9.3	*1,048,045	1,139,718	—8.3	*1,224,364	1,217,745	0.5	*126,335	124,586	0.4	*51,824	52,875	—2.0
Total Oil Consumption (Barrels)															
March.....	*145,563	204,537	—28.8	*130,930	125,792	4.2	*148,491	162,310	—8.5	*399,795	391,395	2.2	*674,293	227,967	196.0
Total Gas Consumption (thousands of cubic feet)															
March.....	*0	0	0.0	*166,342	210,161	—20.9	*567,346	581,022	—2.4	*1,015,329	952,200	6.7	*1,424,375	489,371	190.8
Total Gross Revenue from Sale of Energy (Thousands of dollars)															
January.....	$12,180	$11,740	3.7	$49,100	$43,900	11.8	$41,300	$37,000	11.8	$9,780	$8,480	15.4	$14,610	$13,320	9.7
February.....	11,840	10,970	8.0	46,300	40,250	15.2	40,500	36,000	12.5	10,180	8,830	15.2	13,940	12,450	12.0
March.....	10,880	10,740	1.2	44,770	40,240	11.3	38,200	34,280	11.4	9,980	8,850	12.8	14,180	12,200	16.2
Total Operating and Maintenance Expenses (Thousands of dollars)															
January.....	$6,450	$6,635	—2.8	$20,800	$17,280	20.4	$20,680	$18,680	10.7	$4,430	$3,920	13.2	$5,310	$4,440	19.5
February.....	5,323	5,178	2.5	18,740	16,290	15.2	18,570	16,720	11.2	4,890	4,145	18.2	5,780	4,150	39.4
March.....	4,840	5,300	—9.5	18,970	17,480	8.5	19,080	17,570	8.6	4,980	4,410	13.2	6,180	4,240	45.8

* As reported to U. S. Geological Survey.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Paris to Have New Station Larger than Gennevilliers

To the Editors of the ELECTRICAL WORLD:

In the issue of the ELECTRICAL WORLD for February 23, 1924, page 398, there appeared a news item entitled "Paris to Increase Its Light and Power Plants." The writer of this item certainly possessed only very incomplete and erroneous information, and I shall be glad if you will insert, with the compliments of an old subscriber, the following rectification of his statements:

The Gennevilliers central station contains generating units rated at 40,000 kw., not 45,000 kw., and, except for certain corrections which it has been necessary to make in two alternators, these units have continuously been able to produce their guaranteed power. The Gennevilliers station was not threatened by the winter floods. The Vitry power house, which dates from 1907 and of which the remodeling has not been finished, was stopped for twenty-four hours.

The demand for energy in Paris and its environs, just as in the other large cities of the world—New York, for example—grows very rapidly. The annual increase at Paris is more than 20 per cent. That is the reason why it has been necessary to enlarge existing stations and build new ones. The Union d'Électricité is installing at Gennevilliers a sixth generating unit rated at 40,000 kw. and identical with the former ones and has just ordered two supplementary units of 50,000 kw. each. It will, moreover, soon begin the erection at Vitry of a new generating station, to be called South Vitry, which will have a capacity exceeding that of Gennevilliers. (COL.) E. MERCIER.

Union d'Électricité,
Paris, France.

Lighting and the Pupil of the Eye

To the Editors of the ELECTRICAL WORLD:

I have noted with interest a letter by Davis H. Tuck (ELECTRICAL WORLD, May 31, page 1133) taking issue with an editorial which appeared in the ELECTRICAL WORLD for April 26. Mr. Tuck does not seem to be aware of recent data which have been published on this subject. It is quite true that it takes some time for the pupil to attain a steady state as to size when exposed to a brightness differing from that to which the eye has been previously adapted.

Data published by P. Reeves* show that the size of the pupil when the eye is exposed for fifteen minutes to a brightness of about 10 millilamberts is more than a millimeter smaller than after it is exposed fifteen minutes to a brightness of about 1 millilambert. I have presented the data and discussed this in Chapter VIII of "Light and Work" and have also made some statements coinciding with your editorial. These are based not only on such work as I have referred to, but also upon work conducted in this laboratory during the past year or two. We have found that the diameter of the pupil of the eye settles down to a size as much as 2 mm. smaller for ordinary bad lighting conditions than for good lighting conditions.

Mr. Tuck is mistaken in the general statement that the pupil of the eye when exposed to a relatively bright surface momentarily contracts and finally opens again to its normal value. This is contrary to the work of Reeves and contrary to our work. The pupil of the eye fluctuates in size with focus, and an investigation of it must be elaborately and carefully made. Certainly new data on the subject indicate that the pupil is not merely a temporarily protective device during the process of adaptation of the retina.

Any one can establish this for himself by looking at his pupil in a mirror after prolonged exposure to daylight conditions outdoors or to glaring lighting conditions. Then he may repeat this simple experiment by looking at his pupil after he has become well adapted to the soft lighting at night in his living room where well-shaded portable lamps provide the lighting. He will find the pupil size very different in the two cases.

In other words, I wish to state that your editorial is supported by plenty of data which can scarcely be refuted. These data also have the advantage of being positive data rather than negative. M. LUCKIESH.

Lighting Research Laboratory, National Lamp Works of General Electric Company, Cleveland.

*Journal of the Optical Society of America, Vol. 4, 1920, page 35.

Ionization of High-Voltage Cables

To the Editors of the ELECTRICAL WORLD:

In the column "Letters from Our Readers" in the ELECTRICAL WORLD for July 14, 1923, W. A. Del Mar cites a paper of mine of 1922. He undoubtedly means the paper entitled "The Ionization Point of High-Voltage Cables," which appeared in the *Elektrotechnische Zeitschrift*, 1922, Nos. 17 to 19, and in abstract in the London *Electrician* of August 18, 1922. Possibly some of Mr. Del Mar's misconceptions are due to a poor translation; he has apparently missed the main point of my paper, and as there seem to be other inaccuracies in his letter, I am taking this opportunity of correcting these mistakes through your columns.

Many of the main points cited are wrong. Mr. Del Mar says in one place that I contended "that the variation of the power factor with voltage is *not* to be explained by air ionization." This is absolutely erroneous, because, on the contrary, I emphasized ionization in a cable containing air and voids. I pointed out in this paper, and this was its very object, that the fact that the power factor of a particular cable is not constant is not *ipso facto* a proof that it contains air or voids, but that this may be due to a number of other causes.

Again Mr. Del Mar says: "He did not say what these properties are and brought forward very little experimental evidence to support this theory." This latter remark is quite surprising as my paper was simply packed with "experimental evidence," principally of American origin. It is true that I did not try to give more or less speculative explanations of the facts; for instance, "alignment of particles," which Mr. Del Mar seems to prefer, though, by the way, this is a process rather difficult to understand in a compressed body of paper and jelly compound. MARTIN HÖCHSTÄDTER.

The Hague, Holland.

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

Conferences Keep Automatic Equipment Operating

By G. H. English
Load Dispatcher Kansas City Power & Light Company, Kansas City, Mo.

UNLESS automatic substation equipment is continually watched from an operation standpoint, failure of certain apparatus, including relays and starting devices, may cause serious trouble on the entire distribution system. To prevent this the Kansas City Power & Light Company holds a conference each Tuesday morning with a group of men composed of the maintenance foreman, meter foreman, automatic substation electrical engineer, load dispatcher and the inspector on automatic equipment.

Kansas City Power & Light Company
AUTOMATIC SUB-STATION FAILURE REPORT

Sub-station ..... Time ..... Date .....
Device: .....
Description of Trouble: .....
.....
.....
.....
.....
Primary Cause of Trouble: .....
.....
.....
How Trouble Was Remedied: .....
.....
.....
Is Same Trouble Likely to Develop Again: .....
.....
Effect Upon System: .....
.....
Station Out ..... Hrs. ..... Minutes.
Feeders or Circuits Out ..... Hrs. ..... Min.
Remarks: .....

REASONS FOR FAILURES AND THEIR EFFECT ARE RECORDED ON THIS REPORT

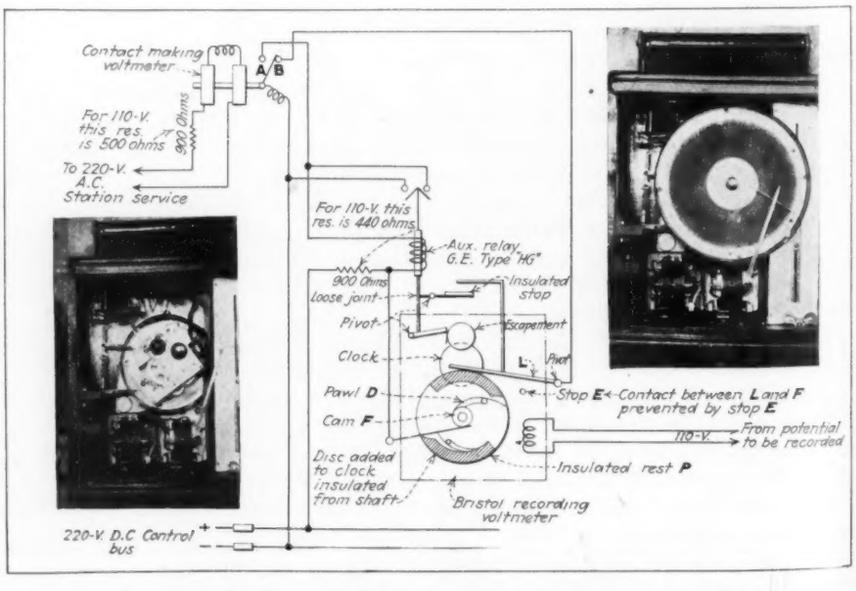
At this time all troubles with automatic substation equipment which have been reported during that week (on the report blank shown herewith) are discussed. The purpose of this conference is to define what part of the automatic equipment failed and what was wrong with it and then to determine some remedy. It is up to this committee to determine whether failures were due to the fault of the apparatus itself or to negligence on the part of the maintenance men and then to prevent any recurrence of the trouble. By having these conferences directly with the men responsible for the correct operation of the automatic substations many troublesome problems interfering with continuous service have been solved.

Better Records of Voltage Fluctuation During System Trouble

By George S. Diehl
Chief Operator Highlandtown Substation, Pennsylvania Water & Power Company

IF THE voltage fluctuations that take place during system disturbances could be read on a basis of seconds instead of minutes during the trouble, valuable data would be obtained to assist in making a study of the disturbance and the timing of major switching operations would be revealed. An oscillograph would supply this information, but it would be too complicated and expensive for general station use. The Pennsylvania Water & Power Company has always made a careful study of disturbances, and in order to assist in this work has developed an instrument that spreads the graphic voltage record over more than ten times the normal time space. The instrument, commonly called a fast-moving voltmeter, consists essentially of a Bristol recording voltmeter with a fifteen-minute clock mechanism, an 8-in. round chart, a second Bristol voltmeter element converted into a contact-making voltmeter and an auxiliary relay the armature of which controls the clock mechanism through levers and contacts. Several of these instruments have been in service for several years and have given very satisfactory service.

When the voltage is about 90 per cent of normal the instrument does not operate, but when the voltage falls below 90 per cent of normal, operation is started by the contact-making voltmeter closing a circuit that closes the relay and releases the



INSTRUMENT THAT RECORDS EXACT FLUCTUATIONS OF VOLTAGE DURING DISTURBANCES

clock mechanism. The percentage of reduction in voltage at which operation starts may be varied.

The contact-making voltmeter element and the graphic voltmeter element are connected to the potential for which the record is desired. In this case the graphic element is connected through a potential transformer and the contact-making voltmeter element is connected to the station service.

Disturbances are usually of short duration, after which the voltage becomes normal. The clock mechanism is so modified by the installation of a brass disk mounted on one of the shafts that it operates in periods of three and three-quarter minutes, once it is started. On account of the fact that the voltage does not always come back to normal, but within a few per cent of normal, 90 per cent of normal voltage has been considered a desirable voltage to discontinue operation. If the voltage is above 90 per cent of normal at the end of a period of three and three-quarter minutes, the relay will open and the mechanism stop. Charts may be left on for more than one period of operation. They should never be removed until conditions become normal. In one series of troubles a graphic record was made for more than thirty minutes with very clear-cut variations. If the voltage is not above 90 per cent of normal, the mechanism will continue to function for another period.

It was found that ink did not make a suitable record where the chart was operated at this speed, but that a smoked chart and a standard pen did give a good record. This smoked chart can be fixed by submerging it in "pyrene." Care must be exercised not to ruin this chart before it is fixed. Two illustrations of the complete instrument are shown, one with the chart in place and the other with the chart face removed.

An explanation of the schematic wiring diagram will show how the instrument operates. When the voltage drops below 90 per cent of normal, the contact-making voltmeter opens the contact at *B* and makes contact at *A*. The closing at contact *A* causes the auxiliary relay to function, which closes contact *C* and releases the friction on the escapement wheel. The releasing of this friction permits the clock mechanism to start operation. Contact *C* is provided to prevent the relay armature from releasing and stopping the clock by applying friction to the escapement wheel as soon as contact at *A* is broken. The regular Bristol graphic voltmeter is connected to the same source of potential that energizes the contact-making voltmeter, which is the potential desired to be recorded. A record is then made on the chart.

As stated above, the mechanism operates in periods of three and three-quarter minutes and will continue to operate until the voltage has returned to a predetermined value at the end of a period. If the voltage returns during the period, the mechanism continues for its full period as the insulated rest holds lever *L* until the end of the period. If it has not recovered to this value, it will continue another period.

In order to discontinue operation, the voltage returns to the proper value, which opens contact *A* and closes contact *B*. When the special brass disk carrying pawls, insulating rests, etc., mounted on one of the clock shafts, insulated from the shaft, moves far enough *L* will drop, and in doing so it will strike a contact extension on the pawl *D*, which makes a momentary circuit through the disk and cam *F* that shunts the relay and breaks contact at *C*.

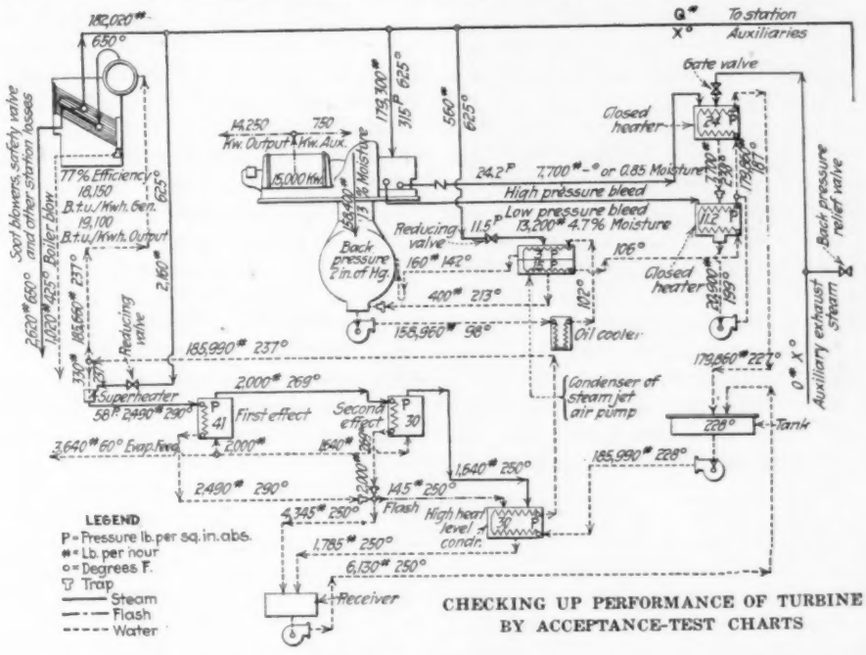
In shunting the relay the armature is released, and through levers friction is applied to the escapement wheel, which stops the clock. If contact is not made at *B*, the shunting circuit is not closed when lever *L* strikes pawl *D*, and the mechanism continues to operate.

The disk makes one revolution in seven and one-half minutes. The shunting circuit can be closed twice each revolution when lever *L* trips the pawl. Lever *L* cannot make contact with cam *F* because of the interference of stop *E*. The pawls do not interfere with cam *F*.

A Guide for the Steam Operating Force

AFTER contemplating the acceptance tests on the new turbine unit recently installed, the Memphis Power & Light Company filled in the heat-balance diagram for this particular unit as indicated in the accompanying illustration for quarter, half, three-quarters and full load. Blueprints of these diagrams were posted in the station at a convenient point for reference by the operating crew. By thus indicating what performance can be obtained under test conditions when new the company affords its operating force a criterion of what can be expected from the unit during operation. If the values for any load change during the operation of the unit, the operators can readily tell the cause. If the cause cannot be removed during operation or in normal shutdown periods, the operators can also tell whether the depreciation in performance is serious enough to warrant a complete overhauling.

Comparison of the values listed with those which occur during operation is facilitated by various meters such as all progressive companies are installing, but the readings from which are not usually so readily interpreted.



CHECKING UP PERFORMANCE OF TURBINE BY ACCEPTANCE-TEST CHARTS

Annunciators Facilitate Station Operation

Southern California Edison Company's Engineering Department Develops New Type Which Combines Accuracy, Reliability and Visibility

BY H. E. BARDEN
Southern California Edison Company, Los Angeles

IN DESIGNING generating stations and substations means must be provided for informing the operator the instant any abnormal condition arises. One of the latest pieces of the auxiliary apparatus which have been installed to aid the operator in reducing the duration of interruptions to a minimum is a new type of annunciator designed by the engineering department of the Southern California Edison Company. It embodies accuracy and reliability, with ease of visibility, the prime requisites for any satisfactory equipment of this nature, and it is a considerable improvement over the old drop-type annunciator, which was not altogether reliable. The purpose of an annunciator in a station is to warn the operator of each and every switch which "kicks" out in case of trouble, any high temperature on transformers, generators or condensers, the grounding of lines on an ungrounded system, the lowering of voltage, etc.

Two different types of annunciators have been developed, one for use in large stations having a long switchboard which provides an indication for each circuit breaker, and the other for use in smaller stations where provision is made for indication of groups of oil circuit breakers. The larger type (Fig. 2) is mounted in a metal box which is usually placed in the operator's desk with a glass cover flush with the top of the desk. A push switch for resetting the annunciator is placed in the front side of the desk, and the relays which operate the lamps are placed on the switchboard panel, together with the alarm bell. A lamp is provided for each circuit to be recorded, as well as a master lamp above the others which indicates each operation of the annunciator. Such a type has been installed at the 220-kv. Laguna Bell substation. Referring to Fig. 2, its operation is as follows: If an oil switch trips out, the auxiliary *HG* relay, which is actuated by the line relay, operates a trip relay and also a second *HG* relay. The latter closes one circuit which rings an alarm and another circuit which lights two lamps in the annunciator. One of these gives a red pilot light connected in common to all relays. The other gives a white light, which indicates the cause of the alarm. Each lamp has a small caption below it, giving the name of the switch, generator bearing, or whatever piece of equipment may have been the cause of trouble. If one of the white lamps should burn out, the red light and alarm bell will cause the operator to investigate.

The push switch has three positions and normally is in the central one. When the alarm bell rings the operator pulls this switch into the forward position, which cuts out the bell and leaves the lights burning. When he has noted the indication as shown by the lights, he pushes the button through the central position and into the rear position, which releases the relays and puts out the lights, with the following exception. In the case of high-temperature indicators or water-level indicators the light cannot be put out until the thermostat or float has returned to normal position. As soon as the operator releases the push switch a spring forces it back into the middle position.

Several installations of annunciators of this type have been made in forty-six-circuit and ninety-four-circuit sizes. Another type of annunciator, shown in Fig. 2, is made up in six-circuit sizes for group indication for the smaller substations.

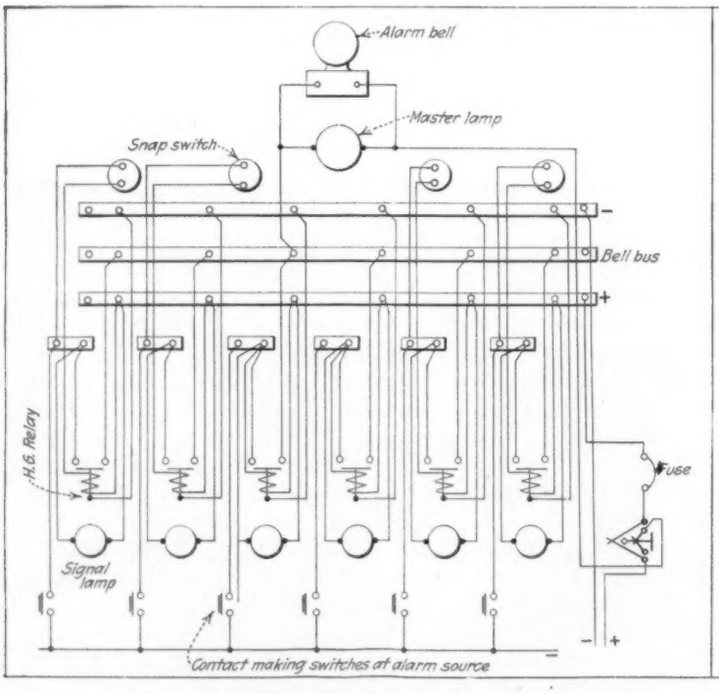


FIG. 1—ANNUNCIATOR FOR GROUP INDICATION IN SMALL STATIONS

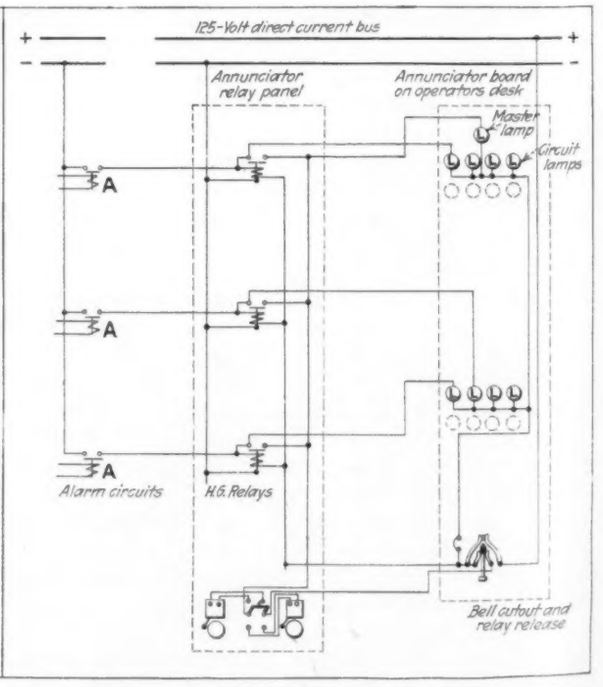


FIG. 2—DESK-TYPE ANNUNCIATOR USED BY SOUTHERN CALIFORNIA EDISON COMPANY

Fig. 2—Pallet switches are now being used in place of line relays at points *A* for switch indications. For high temperature on transformers, generators or condensers, the grounding of lines on an ungrounded system, the lowering of voltage, etc., the light will burn until the trouble is cleared. The *HG* relays used are wound for 125 volts continuous duty.

Towers Raised 35 Ft. to Clear Tramway

BY H. S. BRUBAKER
General Superintendent Tower Line Construction, West Penn Power Company

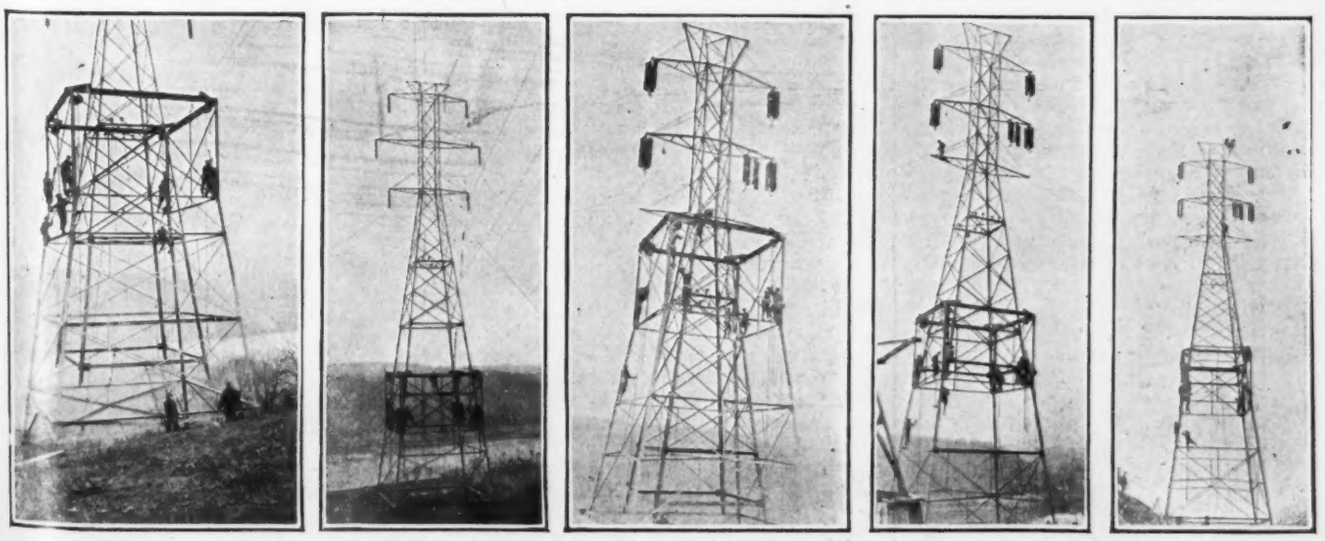
TO TAKE care of ash disposal at the Windsor power house at Beech Bottom, West Va., it was necessary to install an ash-handling tramway to carry the ashes from the power house to a gully about three-quarters of a mile distant, where the ashes are dumped.

In building this tramway clearance could not be had under the Windsor-Washington 66/132-kv. power wires, and it became necessary to raise these wires to give sufficient clearance over the tramway. To do this required the raising of two of our transmission-line towers about 35 ft., one of these towers being a dead-end tower and the other one of our standard suspension-type towers. The foundations of these towers were designed and fabricated so as to continue the present tower batter. This allowed the new foundations to be built about 4 ft. outside the old foundations and the 35-ft. extension erected outside the present tower.

Several methods of raising these towers were considered and discarded, and it was finally decided that a steel frame would be built on the outside of the new extension and on the inside of the present tower in such a manner that the tower itself would be loosened from its present footing and raised vertically the 35-ft. distance to the new extension. The foundations were poured, the extensions were set and all work was made ready for the raising of the first tower, and on April 20 last the power lines were shut off and the wires removed from the tower. The tower was guyed in four directions to stabilize it while it was lifted vertically into place by means of four 2-ton chain blocks. The actual raising time was one hour and ten minutes, although it was one hour and forty minutes from the time we started to raise the tower until it was finally fastened into place.

The second tower, which was raised on Sunday, April 27, was our heavy-type dead-end tower and stood on a hillside where the few remaining tree stumps made very poor attachments for our guys and necessitated exceptionally long side guys. This also meant that the six power wires would have to be taken off the tower and new wires strung from the tower to the Windsor substation to eliminate splices in our wires, the wires would have to be redead-ended and properly sagged, and all this work would have to be done between daylight and darkness. As the top of the lifting structure projected slightly above the top of the lower crossarm, it was necessary to raise the power wires which were normally attached to the lower crossarm up to the second cross-arm and to loosen the lower cross-arm temporarily, raising it so as to complete the construction of the raising frame. The raising of this tower took about one hour and fifteen minutes from the time we started until the job was finished and the wire men had started to rehang the circuits. This tower was 80 ft. in height and weighed 10,600 lb. The first tower raised weighed 8,600 lb. and was 90 ft. in height.

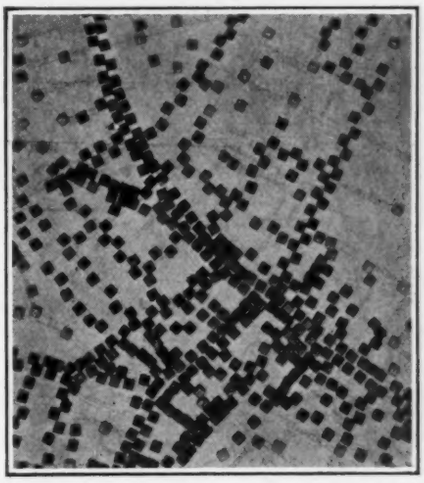
The accompanying illustrations show the raising structure and apparatus, the towers before raising, while being raised and after completion but before the raising structure had been removed.



ADDING 35-FT. EXTENSIONS TO SUSPENSION AND DEAD-END TOWERS

Map Used to Show Density of Street Lighting

A CONVENIENT map 9 ft. high and 7 ft. 6 in. wide, drawn to a scale of 500 ft. to the inch, has lately been prepared under the direction of George M. Hardy, general superintendent Worcester (Mass.) Electric Light Company, to enable the location, size, class of service and type of every street lamp on the system to be kept up to date. Lamps are indicated by pins with numbered heads $\frac{3}{16}$ in. square, colored according to the following schedule: 6.6-amp. arcs, all night, underground—red; same, half night—yellow; 4-amp. arcs, overhead—blue; same, underground—indigo; 100-cp. incandescents, overhead—light green; same, underground—pale yellow; 80-cp. incandescents, overhead—violet; same, underground—olive green.



MAP SHOWING STREET LAMP LOCATIONS

Twin lamps are indicated by a

black border around the pinhead and private lamps by a combination of red and blue head. Pole numbers are also indicated on the pinheads. In considering locations for new lamps the map has been helpful both to the company and to city officials, as the relative extent of illumination in different localities and blocks can be seen at a glance.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Grounding of Secondary Circuits

Location of Secondary Grounds.—One secondary ground, at least, shall be made for each transformer (or bank of transformers) at a pole adjacent to the transformer pole. Where secondaries run direct from the transformer pole without being attached to other poles, the secondary-ground connection shall be made on the customer's premises at the safety cabinet ahead of the meter and preferably to the water piping. Other ground connections in addition to the one specified as necessary shall be made as may be required.

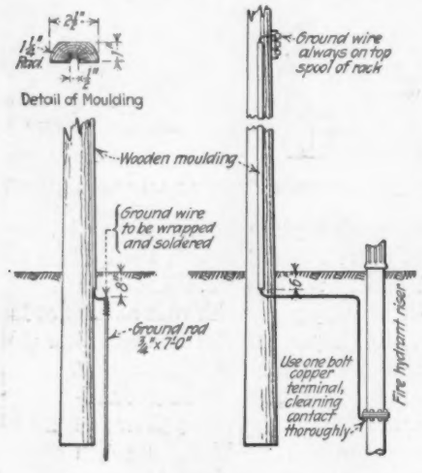

Detail of Moulding
Ground wire always on top spool of rack
Wooden moulding
Ground wire to be wrapped and soldered
Ground rod ¾"x7'0"
Use one bolt copper terminal, cleaning contact thoroughly
Fire hydrant riser

FIG. 60—NORMAL METHOD OF GROUNDING SECONDARY CIRCUITS

Where current or potential transformer secondaries require grounding, the ground connection shall be made in the customer's premises and preferably to the water piping. Where lighting and power secondaries parallel on the same pole, the same ground connection shall be used on both circuits.

Grounds may be made by connecting to metallic water pipes in the street, to artificial grounds or to metallic water pipes on customer's premises. Preference shall be given in the order named. At least one ground connection for each circuit supplying two or more customers shall be made outside of customer's premises, while additional grounds may be made on customers' premises.

Size of Ground Wire.—The ground wire shall be of copper not smaller than No. 6 for street connections to metallic water systems, to ground pipes or other artificial grounds, and not smaller than No. 10 on customers' premises. Weatherproof wire shall be used except on customers' premises, when rubber-covered wire shall be installed.

Normal Method of Grounding.—Secondaries shall usually be grounded as shown on Fig. 60. In case a guy wire must pass around a piece of ground wire molding, the molding shall be protected from injury by means of blocks of wood, or a metal shim placed between the guy wire and the molding. In case a ground wire must pass a guy strand or guy shim, a block of wood shall be nailed on the pole over the guy to insure no contact with the ground wire. In case a ground wire is so located that the wooden molding is exposed by traffic to abrasion or other damage, the molding shall be protected by No. 20 gage galvanized sheet iron nailed to the pole over the exposed portion of the molding.

Connections to Water Pipes.—Ground connections shall be made to water systems only in districts in which they consist entirely of metallic pipe throughout a considerable district and to which the water company has granted permission to attach, but not to systems with cement joints, nor to gas or steam pipes. In most cases the connection can be made with a one-bolt copper terminal bolted to the fire hydrant riser flange after first cleaning the contact. Where necessary use method shown in Fig. 61A.

Connection to Driven Rods.—Where no metallic water pipe is available, the ground connection shall be made to a ¾-in. copper-weld rod approximately 7 ft. long, driven as shown in Fig. 60. An effort shall be made to leave the dirt fitting as snugly as possible against the rod. A bar in some cases may be used to form the hole before the ground rod can be successfully driven to the required depth. A pailful of salt water may be poured around the rods and about 75 lb. of salt buried around their tops about 3 ft. or so below ground level, where necessary to give "satisfactory" ground connections.

Connection to Other Artificial Grounds.—Conditions will be met in many localities where "satisfactory" artificial rod grounds cannot be made, in which case there may be used: (a) No. 0 bare copper wire coiled under the butt of the pole and brought up along the base of the pole; (b) a copper plate of at least No. 16 Stubbs gage, copper buried in charcoal, or (c) some other approved artificial ground. Approval of other artificial grounds will be made as required by the office of the distribution engineer.

Connection to Water Pipes on Customers' Premises.—Where conditions are favorable, ground connections may be made to water pipes on customers' premises by means of an approved clamp (Fig. 61B), but in all such cases Section 15-A of the National Electrical Code of the National Board of Fire Underwriters must be strictly followed. The ground connection must be made on the line side of the main switch ahead of the meter and preferably to the street side of water meters, main cocks, etc., of the water system. Where the connection cannot be made to the street side of the meter, cock, etc., they must be jumpered, using approved clamps and rubber-covered wire protected from mechanical injury. The ground wire must always be rubber-covered and shall be protected with wooden molding where exposed to mechanical injury. Where the ground wire is run through any part of a building, unless run in approved conduit, it must be protected by porcelain bushings through walls or partitions, and shall be run in approved moldings, except that in basements it may be supported on porcelain knobs.

Joining Grounded Secondary Circuits.—In cases where it is impossible to get "satisfactory" ground connections by the usual methods described above, it is often possible to connect the grounded wire of two or more secondaries together by stringing short lengths of additional wire and thus connect several ground connections in parallel. Wherever this is done the distribution engineer shall be so advised.

Tests.—Ground connections shall be periodically tested by connecting from the ungrounded wire of the grounded circuit to a good ground (such as fire hydrant, water tap, ground pipes, etc.) through a 5-amp. or 10-amp. fuse. If the ground is satisfactory, the fuse will blow. The 5-amp. fuse should be used with circuits which have 115 volts to ground, and the 10-amp. fuse should be used with circuits which have 230 volts to ground.

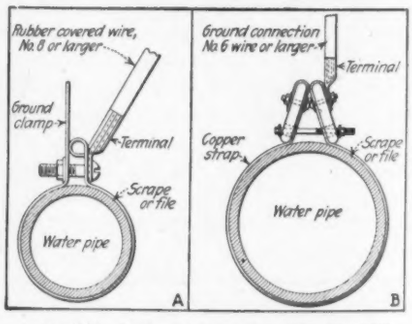


FIG. 61—GROUND CLAMPS FOR WATER PIPES

Lightning Arrester Grounds.—Grounds for lightning arresters shall always be kept entirely separate from secondary grounds. Arrester ground connections shall be made in the manner specified for secondary grounds, except that they shall never be made in customers' buildings. They should be made to water pipes, if possible, and may be connected to the same water pipes as secondary grounds, provided the connections are one foot or more apart.

Transformer-Case Grounds.—Grounds for transformer cases may be attached to lightning-arrester grounds, but shall always be kept entirely separate from secondary grounds.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Central Station Organizes to Get New Industries

AN INDUSTRIAL agents' department has been created by the Northern Indiana Gas & Electric Company for the purpose of co-operating with local chambers of commerce and other business men's organizations in getting new industries to locate in the communities where the company operates.

The office of the department will be in the Public Service Building, Gary, Ind., but direct contact with industrial developments in each community will be maintained by a representative of the department in each local office. Early in this year the company issued an illustrated booklet entitled "The Workshop of America," in which the industrial advantages of northern Indiana were emphasized. In its advertising the company has featured the rapid industrial development of the territory, which is known throughout the state as the Calumet district.

The department will keep in touch with industrial developments and contemplated expansions or moving of factories and plants and will endeavor to interest heads of industrial concerns in locating in the communities served by the company. The advantages of each community will be listed and information will be gathered in reference to possible factory sites, housing and labor conditions and other things of interest to manufacturers.

Kitchen Lights Add $6,600 in Annual Revenue

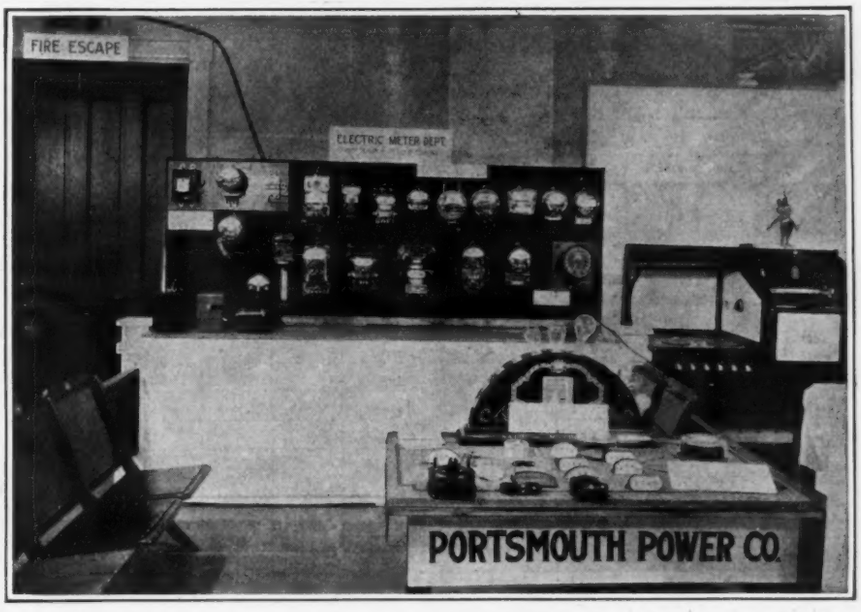
DURING a sixty-day kitchen-lighting campaign put on recently by the Pacific Power & Light Company, with headquarters at Portland, Ore., a total of 2,226 daylight units were sold. Of the total residential customers in the fifteen districts of Oregon and Washington served by the company, 8½ per cent were reached, and it is estimated that the campaign added approximately $6,600 per year in additional revenue. Five districts placed units with more than fifteen per cent of their residential consumers, thus exceeding the sales quota assigned to them.

Prizes were awarded to the men making the highest number of sales. The first prize of $25 for full-time men was awarded for the sale of 192 units, while the second prize of $15 went to a man making 149 sales. For half-time salesmen the first prize of $25 was given for making 126 sales, and the second prize of $15 was given for placing 114 units.

The sale of the units during the campaign was entirely in the hands of salesmen employed in the various districts. It was found that in most instances the contractor or electrical dealer was not able to see the advantage to his business which would result from participation in the sale. Less than 1 per cent of the sales were made through electrical dealers. In most of the larger properties it was found difficult to place as many units as had been anticipated. This was perhaps due to the fact that the units had to be sold by demonstration, which necessitated house-to-house solicitation. In the large cities and towns the housewife has become somewhat skeptical of any article of merchandise sold in this way, regardless of its possible merit. The results, however, are considered entirely satisfactory in view of the fact that this was the company's first attempt to introduce better lighting in the home.

Instructive Meter Exhibit At Electric Show

AT A RECENT electric show conducted by the Portsmouth (N. H.) Power Company and attended by six thousand people (an average of one visit per customer) the meter department of this utility had a fine exhibit designed to remove from the mind of any one unfamiliar with metering the idea that it is a mysterious operation. As shown in the illustration, the exhibit showed both old-style meters and the latest designs of energy-recording equipment, portable testing instruments, lamp-bank load and an "exploded" meter, the last article showing the chief parts entering into such a unit. All recording meters were connected in series and most of them were mounted in glass cases according to the company's regular practice, so that the effect of turning



METER EXHIBIT AT ELECTRIC SHOW VIED IN INTEREST WITH APPLIANCE DISPLAYS

on various loads could be readily compared. A "cents-per-hour" meter was also provided to show the cost of operating appliances, and attendants were constantly on hand to explain the reading of meters, methods of testing, etc. This display attracted a great deal of favorable attention, flanked as it was by a large-scale map of the company's principal lines, station facilities and interconnections with other properties.

Form of Report Helps Settle High-Bill Complaints

WHENEVER the Harrisburg (Pa.) Light & Power Company makes an investigation of a customer's complaint of high bills the accompanying form is used so that a complete history of the case may be placed before the customer when the report is returned to the office. It will be seen that space is provided for a month-by-month comparison of the energy consumption and amounts of bills for the present year and the year previous. Space is also provided for the meter tester to fill in answers to questions concerning conditions which might have an effect upon the amount of energy used. At the bottom of the sheet the results of the test are recorded.

By using this form the company has found that any causes for irregularities can be analyzed much more quickly, and where the report shows that conditions are as they should be it is much easier to satisfy the customer by placing all the evidence before him.

INVESTIGATION REPORT

DATE

CUSTOMER STREET

CAUSE TOWN

METER No. CONNECTED LOAD DEMAND SCHEDULE

	READING	K. W. H.	AMOUNT	METER READER		READING	K. W. H.	AMOUNT	METER READER
January					January				
February					February				
March					March				
April					April				
May					May				
June					June				
July					July				
August					August				
September					September				
October					October				
November					November				
December					December				
Total					Total				

- ☐ Where is Trans. Located? ..... Circuit Location .....
- ☐ Has any change been made to the above? (.....)
- ☐ Has anything been done to Secondary or Trans? (.....)
- ☐ Trans. Secondary Grounded (.....) When Grounded?
- ☐ How is Meter Connected? ..... Was Register Unmeshed for Test (.....
- ☐ Does Ungrounded Wire Connect to Current Coil? ..... Were Register Pointers Tight? (.....
- ☐ Were Both Line Wires Removed During Test? ..... Were Register Pointers in right Position? (.....
- ☐ Was Meter Creeping? (.....) (.....) Revs. in (.....) Sec. = ...Watts. Was Cover removed during Test? (.....
- ☐ Grounded Circuit (.....) (.....) Revs. in (.....) Sec. = ...Watts. Does meter show sign of overload? (.....
- ☐ Were People Away? (.....) When did they leave? ..... When did they return? .....
- ☐ Were Servants or Others in House? ..... Did servants or others have access to house? .....
- ☐ What Appliances Do They Have? .....
- ☐ What appliances are Used? .....

TEST DATA

	DATE M. K. TESTER T. KH. STATEMENT STATEMENT				DATE M. K. TESTER T. KH. STATEMENT STATEMENT				DATE M. K. TESTER T. KH. STATEMENT STATEMENT			
%	AS FOUND		AS LEFT		%	AS FOUND		AS LEFT	%	AS FOUND		AS LEFT	
5%					5%				5%				
100%					100%				100%				

INVESTIGATION REPORT USED BY HARRISBURG LIGHT & POWER COMPANY

Employees Get 1 per Cent for Appliance "Prospects"

THE Washington Water Power Company, Spokane, Wash., has offered a 1 per cent commission to employees for "tips" which result in the sale of electrical appliances. The commission will be based on the cash price of the sale made. Printed post cards will be furnished which must be turned in to the commercial department. Each card will be checked against the salesman's "prospect card" file. If the prospective customer is already on a salesman's card for the appliance mentioned, the employee will be notified and no commission will be given. When the "prospect" is not previously listed and a sale results within thirty days a commission of 1 per cent will be paid. In case of duplicate prospect cards the card with the earliest date will be honored.

The Washington Water Power Company has been very successful in its merchandising activities, particularly in the sales of electric ranges and washing machines. A range campaign which closed May 17 gave indication that it would be as successful as a similar one which was held last year, during which 431 ranges and water heaters were sold in a period of six weeks. In a subsequent campaign 316 ranges were sold in five weeks. The company now has approximately five thousand ranges and water heaters on its lines, the combined revenue from which is close to half a million dollars a year.

Civic Organization Work Improves Relations

VERY close relations are maintained by the Memphis Power & Light Company with such civic organizations as the Chamber of Commerce, the Kiwanis Club, the Cooperative Club and the Electrical League, the utility being represented on each of these clubs by a different department head. The company is altruistic enough to believe that by its officials serving to the utmost in these organizations the clubs will come to feel confidence both in the individuals and in the company they represent. No attempt is made to force utility matters before these organizations, the utility representatives discussing them only when they are brought up by others.

In a recent case an outside man was persuaded to talk on the question of allowing Muscle Shoals to go to Henry Ford. From comments after the meeting there appeared to be a general weakening of the support previously manifest for Ford.

At such meetings the utility members make a point of getting approval of the attendance of newspaper edi-

tors or reporters, so that the remarks made will not be confined to the club membership but may be broadcast to the public.

The Memphis Power & Light Company aims to attract the confidence of newspaper men by its open and aboveboard policy so that they will voluntarily apply to the utility for information they think the public ought to have. The company has fostered this attitude by telling the reporters that whenever any statement is made against the utility in a public address or otherwise that is thought worth printing the utility is always willing to give the newspapers the facts. As a result of this policy the Memphis company is having very fair treatment from most of the local newspapers.

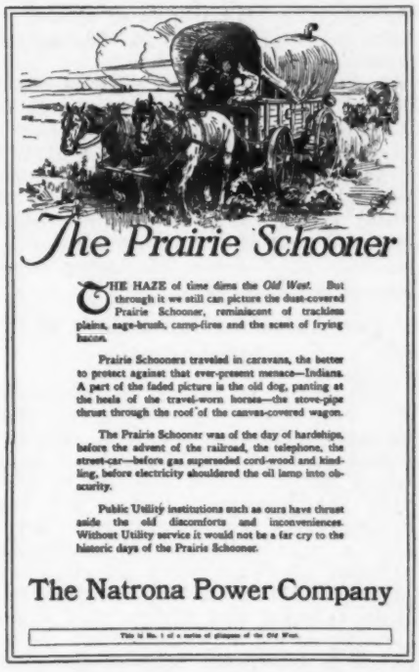
In some cases, like the recent electric home demonstration, the newspapers were advised of the plans to conduct such a demonstration in advance and were invited to have reporters attend. Not only did the newspapers report the opening demonstration, but the happenings every day.

While the company is doing nothing directly at present to attract industries to its territory, it is helping the Chamber of Commerce to do so. This is being done by furnishing information which the Chamber of Commerce can give outside industries to show the value of moving to or building new plants in Memphis. Information is given by the utility company particularly regarding electric service facilities and rates. Other information, such as on labor conditions, transportation facilities, etc., is disseminated by the Chamber of Commerce along with the information received from the utility.

While the state's Public Service Commission has power to say whether rates shall be raised or lowered, the Memphis Power & Light Company endeavors to appeal to the public's sense of justice if a rate increase is necessary. It does so by taking up its requirements with a board made up of certain public officials, including the Commissioner of Gas and Electricity. Not until this has been done is the matter referred to the commission. In some states the utility commission is blamed for rate increases instead of being regarded as an impartial tribunal which has investigated and found rate changes essential. The Memphis procedure has been found to help keep public confidence in the commission.

Linking Utility Publicity with Local History

TO STIMULATE utility advertising in the Rocky Mountain region and more vividly portray the development of utility service to the public, the Rocky Mountain Committee on Public Utility Information is preparing a series of illustrated advertisements to be supplied all member companies. The first series depicts the "Old West," and a specimen of the advertising copy is reproduced here.


The Prairie Schooner
THE HAZE of time dims the Old West. But through it we still can picture the dust-covered Prairie Schooner, reminiscent of trackless plains, sage-brush, camp-fires and the scent of frying bacon.
Prairie Schooners traveled in caravans, the better to protect against that ever-present menace—Indians. A part of the faded picture is the old dog, panting at the heels of the travel-worn horses—the stove-pipe thrust through the roof of the canvas-covered wagon.
The Prairie Schooner was of the day of hardships, before the advent of the railroad, the telephone, the street-car—before gas superseded cord-wood and kindling, before electricity shouldered the oil lamp into obscurity.
Public Utility institutions such as ours have thrust aside the old discomforts and inconveniences. Without Utility service it would not be a far cry to the historic days of the Prairie Schooner.
The Natrona Power Company

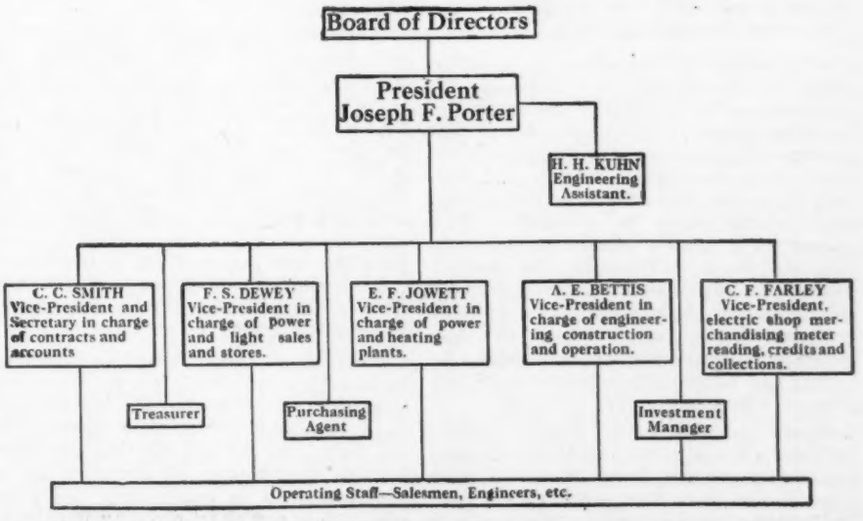
ADVERTISEMENT PUTS LOCAL ATMOSPHERE IN GOOD-WILL PUBLICITY

This service is financed as a committee activity. Matrices for stereotype plates or readymade plates are furnished with proofs to the utilities, which place the copy with the newspapers in their communities. The first advertisement in the series, entitled "The Prairie Schooner," was released for publication recently.

Kansas City Departments in Charge of Vice-Presidents

A SIGNIFICANT indication of the increasing importance which is being attached to the commercial activities of electric light and power companies may be seen in the recent executive reorganization of the Kansas City (Mo.) Power & Light Company. In line with the general tendency among central-station companies to place their various operating departments in charge of the vice-presidents, the Kansas City company now has five vice-presidents in charge of what were formerly departmental activities. As shown in the accompanying diagram, each vice-president reports directly to the president of the company.

In addition to the offices of vice-president and secretary in charge of contracts and accounts, vice-president in charge of power and heating plants and vice-president in charge of engineering, construction and operation, there are also a vice-president in charge of power and light sales and a vice-president in charge of the company's electric shops, merchandising, meter reading, credit and collection. While it would have been possible to combine the two latter vice-presidencies, it was felt that the amount of work in each of these former departments had become too heavy for one man to handle and therefore the division of responsibilities was made.


Board of Directors
President Joseph F. Porter
H. H. KUHN Engineering Assistant.
C. C. SMITH Vice-President and Secretary in charge of contracts and accounts
F. S. DEWEY Vice-President in charge of power and light sales and stores.
E. F. JOWETT Vice-President in charge of power and heating plants.
A. E. BETTIS Vice-President in charge of engineering construction and operation.
C. F. FARLEY Vice-President, electric shop merchandising meter reading, credits and collections.
Treasurer
Purchasing Agent
Investment Manager
Operating Staff—Salesmen, Engineers, etc.

ORGANIZATION DIAGRAM OF THE KANSAS CITY POWER & LIGHT COMPANY, SHOWING VICE-PRESIDENTS IN CHARGE OF FORMER DEPARTMENTS

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
from All Parts of the World

Photostat copies or English translations of complete articles will be furnished at cost upon request

Hydro-Electric Development and Steam Equipment

New Power Station at Peoria, Ill.—The Central Illinois Light Company is erecting a station at Peoria which will ultimately have a rating of 100,000 kw., the first installation now under way having two 20,000-kw. turbo-generators. Each turbo-generator will be served by two boilers burning powdered coal, operating at a steam pressure of 350 lb. to 400 lb. and superheat of 250 deg. F. Some of the features of this station are the closed feed-water system with automatic de-aëration of water, stage bleeding at four points to serve evaporator and closed heaters, house generator and exciter on main unit shaft, U-fin-type surface coolers for generators and hydraulic sluicing of ashes.—*Power*, April 22, 1924.

Protection of Steam-Turbine Disk Wheels with Axial Vibration.—W. CAMPBELL.—One of the most important features in the design and manufacture of a steam turbine is the elimination of the possibility of vibration occurring at the various natural frequencies of its disk wheels and buckets. The author describes an investigation by the company with which he is connected of various forms of vibrations and waves which may exist in steam-turbine disk wheels. The dangerous critical speeds that must be guarded against are discussed, together with other minor resonant conditions that it is advisable to avoid. The testing machines used for verification of predicted frequencies at critical speeds are described in detail, as well as the different types of tests made. The conclusion gives the procedure necessary in all cases for the definite protection of steam-turbine bucket wheels from axial vibration, as justified by several years of successful manufacture.—*Paper presented before the A. S. M. E., Cleveland*, May 26-29, 1924.

Characteristic Equations of Reaction and Impulse Water Turbines.—H. W. COULTAS.—The author deals with the relations between the head, power, discharge and speed of turbines and shows how these factors are related and how equations for the characteristic curves of turbines may be obtained. The paper is a purely mathematical one, dealing very fully with the matter under consideration. A large portion of the paper is occupied by a consideration of the Pelton wheel, and numerous equations are produced to verify the author's conclusions.—*World Power (England)*, May, 1924.

Tests on Propeller-Type Water-wheels.—H. MIKYSKA.—Although encouraging results have been obtained during the last few years with propeller-type water turbines, only small diameter wheels have so far been built. The Czechoslovakian government has therefore undertaken some official tests on specially built wheels of that type, with diameters up to 6 ft. The article gives many data on several of these wheels tested with brake bands under actual operating conditions. As there has been little published on the characteristics and the performance of this type of turbine, the paper should prove of considerable interest. Several of these wheels will be installed in federal power plants of Czechoslovakia.—*Zeitschrift des Vereines Deutscher Ingenieure*, April 26, 1924.

Transmission, Substations and Distribution

Automatic Induction Regulators.—For large capacities and very rapid voltage fluctuation specially designed induction regulators have been built which use oil under pressure to provide the necessary torque for the armature. A small voltage relay actuates a pilot valve, which admits oil pressure above or below an auxiliary piston, and this in turn controls the main cylinder and piston. To avoid over-regulation a simple setback mechanism is interposed between the pilot and the power piston. To insure quick response of the pilot valve a magnetic vibrator keeps it in constant motion. The mechanism is capable of turning the armature of the regulator from minimum to maximum within one and one-half seconds. A handwheel is provided to permit resort in emergencies to manual operation. A small motor may also be added to allow remote control. Regulators of this design can be built for torques of 300 ft.-lb. to 4,000 ft.-lb. The article describes in particular three models of 2,500 kva., 5,000 kva., and 7,000 kva., three-phase output equipped for self-cooling or for forced-air cooling.—*Bulletin Oerlikon*, March, 1924.

Protection Against Lightning.—The tentative report of the committee on protection against lightning. This report is the result of work done both by the N. F. P. A. and the committee on the same subject acting for the A. E. S. C. under the sponsorship of the United States Bureau of Standards and the A. I. E. E. The report contains an interesting table of comparative fire losses from lightning in rodded and unrodded properties.—*Bulletin of the National Fire Protection Association*, 1924.

Improving Central-Station Service by the Application of Current-Limiting Reactors to Distribution Feeders.—D. K. BLAKE.—The author emphasizes the fact that current-limiting reactors furnish the means of maintaining a high standard in minimizing the voltage drop under short-circuit conditions. He advises their increased use outside of generating stations, the field to which their use is at present mostly confined. Their advantages and usefulness in distribution feeders are pointed out.—*General Electric Review*, June, 1924.

Circuit-Breaker Tests.—J. D. HILLIARD.—A short abstract of this paper may be found in the ELECTRICAL WORLD report of the A. I. E. E. spring convention, April 19, 1924, on page 766.—*Journal of the A. I. E. E.*, May, 1924.

Generation, Control, Switching and Protection

Experimental Study of Ventilation of Turbo-Alternators.—C. J. FECHHEIMER.—This is a seven-page abridgment of a paper presented by the author at the midwinter convention of the A. I. E. E. He deals with air distribution in machine ventilation using axial, radial and circumferential ventilating designs. Effects of rotation are clearly indicated, and the results suggest means for materially improving the existing ventilating design. The axial gap-flow system was chosen as the best method for the larger units.—*Journal of the A. I. E. E.*, May, 1924.

Reheating in Central Stations.—W. J. WOHLENBERG.—The author discusses the influence of amounts of energy added in reheating, number of reheating stages and points in expansion at which reheating should begin. A comparison is made of reheating, regenerative and combination cycles combining both reheating and bleeding stages, and it is shown that, because of the influence on the internal machine efficiency thereby exerted, reheating properly applied may lead to higher efficiencies than bleeding. It is furthermore shown that the combination cycles give promise of realization of practice of appreciably higher efficiencies than would be the case for the other cycles investigated. The analysis also indicates that for a limiting steam temperature of 750 deg. F. the maximum efficiency is attained at initial pressures varying between 600 lb. and 900 lb., the exact optimum depending upon the cycle, fuel and steam generator used. If pressures are increased beyond these points, there will result an actual reduction in over-all efficiency.—*Mechanical Engineering*, May, 1924.

Units, Measurements and Instruments

Watt-Hour Meter Accuracy on Light, Low Power-Factor Loads.—D. D. EWING and D. T. CANFIELD.—The authors present a summary of the results obtained in an extensive study covering the behavior of ordinary commercial watt-hour meters operated on very light loads of lower power factors. The method of testing and the results obtained are discussed.—*Circular No. 2, Engineering Extension Service, Purdue University.*

Direct-Reading Pyrometer.—F. H. SCHOFIELD and D. C. GALL.—A modified form of disappearing-filament pyrometer is described in which the pyrometer lamp forms one arm of a Wheatstone bridge. The arrangement is such as to enable any particular range of

temperature to be made to correspond with the whole length of the scale of the indicating galvanometer without interfering with its natural zero. Furthermore, any number of pyrometer lamps can be made interchangeable by associating various resistances with them in separable units, thus facilitating the use of direct-reading temperature scales for the galvanometers.—*Journal of Scientific Instruments* (*England*), April, 1924.

Magnetic and Electrical Properties of the Ternery Alloys.—T. D. YENSEN.—The variations in the magnetic properties of iron and iron alloys, even of supposedly constant composition, have been puzzling to the users and investigators of ferro-magnetic materials ever since the introduction of such materials for electrical apparatus. The author has been investigating this problem for more than ten years and since 1916 has concentrated his efforts on iron and iron-silicon alloys. A very complete résumé of his researches is given.—*Journal of A. I. E. E.*, May, 1924.

Illumination

Instrument for the Direct Measurement of Daylight Factor.—A. K. TAYLOR.—The author describes the design and application of a simple instrument for the direct measurement of daylight factor. The instrument is portable and does not require a lamp, battery or other accessory. The scale calibration can be calculated or determined empirically, and its range can be altered by the use of neutral filters.—*Journal of Scientific Instruments* (*England*), April, 1924.

Increasing Production by Good Lighting.—F. L. PRENTISS.—Extensive tests were recently made at the Columbus (Ohio) plant of the Timken Roller Bearing Company in an effort to establish the relationship between illumination and production in the inspection departments. Very valuable data were obtained which proved that for this class of work production was materially increased by a well-designed system of illumination. With the maximum illumination used in the tests the production increase was 12.35 per cent and the total cost of lighting was less than 2.5 per cent of the payroll. A short description is given of the complete test.—*Iron Age*, May 8, 1924.

Heat Applications and Material Handling

Present Tendencies in Electric Brass-Furnace Practice. — H. W. GILLETTE and E. L. MACK.—The authors describe the trend of developments in electric brass-furnace practice in the last two years, supplementing the Bureau of Mines Bulletin No. 202, "Electric Brass-Furnace Practice," published in 1922. The present electric brass-furnace situation is summed up as follows: Two types, the induction and the rocking, indirect-arc, have found increasing favor in the last two years, while the other types have not made appreciable advances. At present there are about 540 active electric furnaces doing commercial non-ferrous melting in the United States, using about 60,000 kw. Of these about 275 are induction furnaces with about 16,000 kw., 135 moving indirect-arc furnaces totaling 28,000 kw., and eighty are of the old-type Bailey furnaces with about 7,500 kw. The remaining fifty furnaces of various types account for the other 8,500 kw.—*Serial No.* 2597 *of the Bureau of Mines.*

Fundamental Economies in Handling Material.—M. L. BEGEMAN.—The author discusses the advantages of handling materials mechanically without reference to any particular type of equipment. The necessity for the substitution of mechanical handling of materials for labor and the economies to be gained by such substitution are the fundamentals which are dealt with. The latter part of the paper takes up in a general way the points to be considered in the analysis of a proposed installation. — *Paper presented before the A. S. M. E., Cleveland,* May 26-29, 1924.

Electrophysics, Electrochemistry and Batteries

Electroplating of Tungsten on Iron.—C. A. MANN and H. O. HALVORSEN.—Salts of tungsten in which the metal occurs as anion are desirable for electrolysis. Such a salt can be supplied to a cell by electrolytic corrosion of a tungsten anode. This was accomplished by using both aqueous and non-aqueous electrolytes containing hydrogen chloride or alkali chlorides, but on electrolysis only an oxide of tungsten was obtained on the cathode. In some cases the resistance of the cell was too high to conduct sufficient current. A fused bath of lithium chloride gave proper conductivity, the tungsten anode corroded to form tungsten chloride, and a deposit of metallic tungsten was obtained on the iron cathode. — *Paper presented before the American Electrochemical Society, Philadelphia,* April 24-26, 1924.

Electric Corrosion of Water Mains.—A. RAUCHE.—The article gives the history of a serious electrolytic corrosion of a water-pipe line running parallel with and close to a direct-current suburban trolley line. Measurements made between the tracks and short pieces of temporarily embedded iron pipes showed heavy currents to circulate between the two. The main cause of the trouble was found to be due to very poor bonding of the rails. As an additional precaution to prevent future damages to the pipe line a number of vertical iron tubes were driven into the ground at close intervals at points where current was found to flow from the water main back to the rails, and these tubes were electrically connected to one another and the main.—*Elektrische Betrieb,* April 24, 1924.

Standardization of Dry Cells. — A conference of manufacturers and users of dry cells was recently held at the Bureau of Standards to standardize these batteries further. The conference adopted standard performance tests for radio batteries and proposed the standardization of sizes of B batteries. To avoid confusion, the adoption of a standard set of designations for all types of dry cells was also recommended.—*Technical News Bulletin No.* 85 *of the Bureau of Standards.*

Telegraphy, Telephony, Radio and Signals

French Broadcasting Station. — R. BELMÈRE.—At Clichy, in the suburbs of Paris, France's most powerful radio station for broadcasting entertainment programs has been recently put in service. The station is connected to a 25-cycle, 5,500-volt, three-phase supply line and contains three 6-kw. motor-generator sets furnishing high-voltage direct current. Each group feeds six tubes at 15,000 volts. The low-voltage current is delivered from a 2,500-amp.-hr., 20-volt storage battery. A 25-kw. water-cooled three-electrode tube generates the oscillatory current. After passing the magnetic modulator from 2 amp. to 32 amp. may be passed to the antenna. The latter is supported from two 330-ft. high steel towers, and is electrically insulated for 60 kv. Programs from this station have been heard in New York (6,000 km.) and in South Africa (8,000 km.).—*Radio-electricité,* April 25, 1924.

Frequency Limits of Speech and Music.—K. W. WAGNER.—The theory of speech and music is so well in hand that any kind of musical note of whatever known timbre can be produced synthetically with such accuracy that the artificial note cannot be told from the natural. Oscillographic investigations disclose the character of vowels, consonants and different musical instruments. Ordinary telephones and telephone lines must carry and reproduce faithfully waves up to about 19,000 cycles in order to insure intelligent speech communication. Very much wider limits have to be set for good transmission of music, such as, for example, for radio broadcasting of musical programs. — *Elektrotechnische Zeitschrift* (*Special Radio Issue*), April, 1924.

Commercial Radio Communication.—E. F. W. ALEXANDERSON.—In describing how some of the problems of commercial radio communication have been solved the author treats them under the subjects of efficiency and cost of radiation, wave propagation, absorption and fading, atmospheric disturbances and speed of commercial signaling. — *General Electric Review,* June, 1924.

Traction

Electric Locomotives for the Imperial Government Railways of Japan.—Three types of locomotives are being supplied by an English manufacturer for the electrification being carried on in Japan. These locomotives are for freight, local passenger and express engines. The freight and local passenger engines are of the 0-4-4-0 type, weighing 58 tons, while the express locomotives are of the 4-6-6-4 type, weighing 100 tons. Construction details for each type of locomotive and control arrangements are described.—*English Electric Journal,* April, 1924.

Railway Electrification in Foreign Countries.—S. P. SMITH.—A general résumé of what has been done in electrification in the various countries of the world.—*Journal of the Institution of Electrical Engineers* (*England*), April, 1924.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Simplifies Motor Ratings

Electric Power Club Approves 40-Deg. Single Rating for General-Purpose Motors

THE principal definite action with reference to standards taken by the Electric Power Club at its recent meeting at the Sea View Golf Club, Absecon, N. J., was to eliminate the modifying clause which it had appended to its simple 40-deg. single rating for general-purpose motors at its last annual meeting a year ago, when it dropped the 40-deg.-55-deg. double rating and the 50-deg. single rating as adopted standards of the Power Club. As the matter now stands, the following as a rating for general-purpose motors is the "recommended practice" of the Electric Power Club: "An open-type general-purpose motor shall be capable of carrying full rated load continuously with a temperature rise not exceeding 40 deg. C." This has not yet been made "adopted standard," but it is expected that not later than its fall meeting the club will be able to make this an adopted standard.

The club's committee on calculations and standardization of shaft bearings, pulleys and belt sizes presented a report based on extensive investigation of the subject, including a study of shaft deflections, bearing alignments, etc., but no action was taken as this is a subject now before the American Engineering Standards Committee and it was thought that individual action by any single association would be detrimental to early agreement on an American standard.

Standards for synchronous motors were adopted and include a temperature rise for continuous operation at 100 per cent capacity, class A insulation, as follows: (1) Core and windings having class A insulation, 40 deg.; (2) field windings having class B insulation, 70 deg., and (3) squirrel-cage and amortisseur windings, any value which would not occasion mechanical injury to the machine or cause deterioration of surrounding insulation. The standard power factor shall be 100 per cent, and a table of starting and pull-in torques is presented varying from a starting torque of 150 per cent and a pull-in torque of 60 per cent for four-pole motors to a starting torque of 100 per cent and a pull-in torque of 30 per cent for sixteen-pole motors.

Ontario Hydro System Shows Balance of $345,588

The system of the Hydro-Electric Power Commission of Ontario had last year a net balance of $345,588, according to the annual report of the chairman, Sir Adam Beck. This amount will be applied to reductions of power bills in the municipalities. The total revenue was $15,742,831, and $2,270,685 was reserved for sinking funds for renewal of plant, equipment and future contingencies.

Sir Adam sets out in detail the results of operations with respect to the thirteen systems, to which are connected 356 municipalities. He declares that the year was the most successful in the history of the commission. The cost per horsepower at Niagara Falls has dropped to $14.45.

Notwithstanding a slackening of industry in Ontario, says Sir Adam, there has been an increase of 120,000 hp. in the demand for power on all systems, some of which are operating to capacity. He warns of an approaching power shortage and advises that the commission of which he is the head should make arrangements to develop additional power.

The total investment of the 356 municipalities is $241,853,201. Experts will be engaged at once in revising rate schedules. The revision will be downward, it is believed, in all but two municipalities. Only eight of the 356 incurred a deficit last year, according to the report.

Muscle Shoals Reports Before Senate

Unanimous Consent for Their Consideration Refused, and They Are Put Over Until the December Session of Congress as Unfinished Business

WITH the presentation to the United States Senate this week from its agricultural committee of majority and minority reports on the Muscle Shoals project the struggle over who shall undertake power development there reached its final phase so far as the present session of Congress is concerned. Despite a vigorous effort by the supporters of the Ford bill to bring on a vote, unanimous consent to immediate consideration was refused and the whole matter went over to the December session as unfinished business.

The majority report, as predicted last week, favored the bill of Senator Norris providing for government ownership and supervision. The minority report, signed by Senator Ladd of North Dakota, Republican, and Senators Smith of South Carolina, Caraway of Arkansas, Harrison of Mississippi and Heflin of Alabama, Democrats, supported the bid of Henry Ford. Both reports contained their full quota of emphatic assertion, the majority utterance attacking the administration's course as vacillating and insinuating that Ford's withdrawal as a presidential candidate was due to an understanding with President Coolidge involving favorable treatment of the Ford offer, and the minority presentment declaring that the Detroit manufacturer's bid had "been made the subject of the most savage attacks which we have ever seen in any legislation."

Provisions of the Norris Bill

The majority report sets forth that the Norris bill contemplates the distribution of all power not needed for fertilizer production and would give the government an important key to a giant power system that could cover the entire South, thus, it declares, preventing power monopoly. Fertilizer, it adds, would be produced either by the Department of Agriculture or a private lessee under the supervision of the department, and power production and distribution would be administered by a body to be created with the name of "Federal Power Corporation," which would use as operating capital, in addition to the $3,472,000 obtained from the Alabama Power Company for the Gorgas plant, accumulating earnings sufficient to bring the total up to $25,000,000, earnings after this point is reached to be turned into the United States Treasury.

The sum of $1,500,000 would be appropriated for the fertilizer business, and, along with numerous other clauses dealing with completion of the properties, construction work and experimental activities, provision is made for the manufacture of explosives for use of the army and navy.

The committee makes the following estimate of the energy that can be developed at Dam No. 2:

	Horsepower
99.4 per cent of the time	87,300
97 per cent of the time	100,000
88.3 per cent of the time, or about ten months	141,000
66⅔ per cent of the time, or about eight months	205,000
50 per cent of the time, or about six months	306,500
20 per cent of the time, or about two and one-half months	600,000
7 per cent of the time, or a little less than one month	1,000,000

The amount of power that will be developed at Dam No. 3 can be readily understood, the report says, when it is known that the power possibilities of that dam are 40 per cent of the power possibilities at Dam No. 2. The difference between high and low water, and therefore the difference between primary and secondary power, is prac-

tically the same at Dam No. 3 as it is at Dam No. 2.

The committee majority condemns Mr. Ford for refusing to appear before the committee in person, assails the real-estate speculation that has sprung from the exploitation of his offer, declares that his bid is the most undesirable of all those submitted, says there are no secrets in fertilizer manufacture and that experiments can best be carried on by the Department of Agriculture, and ascribes the wide support of the Ford offer to skillful and far-reaching propaganda.

Many Licenses Issued

Federal Commission Approves Deschutes, Tallapoosa, Wallenpaupack and Other Projects

THE Federal Power Commission has authorized the issuance of a license to the Columbia Valley Power Company covering two proposed developments in the Deschutes River in central Oregon. A preliminary permit covering the two sites was issued to this company on February 6, 1923. The license, which contains a proviso that in using the sites power must be subordinate to irrigation, covers the construction at Pelton of a masonry dam 165 ft. high at which 51,000 hp. will be developed. At Metolius, which is 8 miles above Pelton, it is proposed to construct a dam 330 ft. high.

The company sets forth that a portion of the power it will develop probably will be sold to the two public utility companies operating in Portland. It is stated that within five years these utilities will have to have 40,000 hp. additional. Power can be developed, it is said, on the Deschutes River cheaper than at sites controlled by the utility companies on the Clackamas River in Oregon and on the Lewis River in Washington. Other markets for power have been investigated, and the opinion is expressed that the full output of the Pelton plant can be utilized on its completion and that construction work will have to be begun immediately on the Metolius plant.

Other Licenses Issued

Pursuant to the preliminary permit issued January 27, 1923, the commission has authorized a. license in favor of the Alabama Interstate Power Company for its Tallapoosa River development, conditioned on the acquirement of state rights before work is begun on two of the dams. The license covers the five sites above the Cherokee Bluffs unit which are necessary to make the fullest practicable utilization of the power resources of the stream. Their combined installed capacity will be 114,000 hp.

The original plan of the company called for three instead of five dams, and the certificate of convenience and necessity issued by the Public Service Commission of Alabama was worded so as to cover only the three dams. Reluctance of the state commission to grant any additional rights on the Tallapoosa is thought to be due to the fact that there is a new realization of the importance of this Tallapoosa storage in connection with the operation of the Muscle Shoals project.

Other licenses authorized at the June 4 meeting of the commission went to the Enterprise (Ore.) Electric Company for a constructed 1,500-hp. plant on the Wallowa River; to the Columbus, Newark & Zanesville (Ohio) Electric Railway Company for an 800-hp. constructed project on the Muskingum River at Zanesville; to the Nevada-California Power Company of Riverside, Cal., for a diversion of the North Fork of Rush Creek into the Jim Lake Reservoir, which feeds an existing power plant on the main stream of Rush Creek, where the diversion will increase the output by 1,000 hp., and to the Pennsylvania Power & Light Company for its 54,000-hp. project on Wallenpaupack Creek in northeastern Pennsylvania.

Networks or Trunk Lines?

Percy H. Thomas' Paper Causes Animated Discussion at Northeastern A. I. E. E. Meeting

EXCELLENT attendance, sustained interest and a diversified technical program characterized the first convention of the Northeastern District of the American Institute of Electrical Engineers at the Worcester (Mass.) Polytechnic Institute on Wednesday and Thursday of this week. Problems of transmission, apparatus design and operation received special attention. Great interest was aroused at the technical session Thursday morning by a demonstration by Prof. Harold B. Smith, head of the department of electrical engineering of Worcester Polytechnic Institute, on the development of a suspension-type, single-unit 110,000-volt insulator. A description of this important development will be published in an early issue.

Giuseppe Faccioli, national vice-president, opened the session on Wednesday morning, introducing C. R. Oliver as chairman of the meeting.

Percy H. Thomas, consulting engineer, New York City, reviewed his recent Birmingham paper on a new type of high-tension network, which discussed the broad solution of the problems of regulation and in connection in the Southeast on the basis of 190,000-volt transmission over assumed tie lines of modern design and emphasized the advantages of a regional network as contrasted with trunk-line transmission.

An extended discussion of Mr. Thomas' paper by representatives of Eastern operating companies disclosed many champions of trunk-line transmission.

Several speakers maintained that short-circuit difficulties on a network are potentially more threatening than on trunk lines. Others looked with disfavor upon the operation of generators in small and inefficient stations for regulation at times of light load, and to others the difficulty of standardizing multi-tap transformers for interchangeable service on networks loomed large. John C. Damon, of Stone & Webster, on the other hand, said that experience with network on the system of the West Penn Power Company bore out the author's fundamental idea.

Farley Osgood, president-elect of the Institute, cited the regulative value of operating generators as synchronous motors on the Public Service Electric system in New Jersey. This is accomplished conveniently by the use of couplings permitting easy disconnection of the generators from their driving steam turbines. Mr. Osgood cautioned his hearers to be sure that transmission equipment will pay for itself upon going into service before recommending its purchase to an executive.

C. R. Oliver, assistant general manager New England Power Company, said that this system's peak load of 140,000 kva. requires the use of 47,000 kva. in synchronous condensers for regulation even after using all the power-factor corrective capacity of the generators in the station. The problem of satisfactorily mounting and insulating conductors has not yet been solved on this system. Mr. Oliver questioned the costs assumed by Mr. Thomas, pointing out that on the recently completed 220,000-volt Davis Bridge-Newberry line, with No. 4/0 copper and eight-disk to nine-disk insulators, the cost of line material alone f.o.b. factory was more than $8,000 per mile.

In closing the discussion Mr. Thomas said that no synchronous motors were required for power-factor regulation in his assumed network, because a slant in potential from the generating to the receiving end of the line was provided, and because he used a split conductor which increased the charging current in 2,500 miles of line by 50 per cent. He maintained that voltage regulation at the power houses of such a system is not a very complex task and said that the relay problem of a network is no longer formidable. Load shifts are less burdensome on a network, and the transformer taps in the assumed case should not exceed 10 per cent.

F. B. Cahall, General Electric Company, then read a paper on transformers for high-voltage testing.

Successful Banquet

On Wednesday evening a banquet was held at the Hotel Bancroft with an attendance of more than two hundred. N. F. Hanley, General Electric Company, talked on the industrial compass, and addresses were made by President-elect Farley Osgood, who said that the Institute should set the standards for electrical progress, making and approving electrical standards before they are submitted to the American Engineering Standarads Committee, because the Institute members have adequate knowledge and because this procedure adds to the prestige of the A. I. E. E. He contended that the institute should cover broadly all activities connected with standardization, leaving to other organizations the field of utilization. Giuseppe Faccioli and others spoke, Prof. Vladimir Karapetoff of Cornell University outlining the method of development engineers should follow to get the most out of life.

The program for Thursday included a technical session under Chairman F. W. Peek of the electrophysics committee and Chairman H. M. Hobart of the electric machinery committee. Besides Professor Smith's paper there were papers by F. Drake and G. H. Browning, E. D. Treanor, F. C. Doughman, T. S. Taylor, C. M. Laffoon, and P. L. Alger and A. L. Kimball, as scheduled in the ELECTRICAL WORLD, May 24, page 1101.

Death of C. E. L. Brown

Noted Engineer and Famous Designer of Electrical Machinery Dies in Switzerland—His Work

THE founder and head of Brown, Boveri & Company of Baden, Switzerland, C. E. L. Brown, internationally known engineer, who for the past ten years had lived in retirement, died at his home in Montagnola, Switzerland, on May 2, after a short illness.

To many electrical engineers of this country Mr. Brown was known by name only inasmuch as his work was done a quarter of a century ago. However, as a designer of electrical equipment he ranked among the world's greatest. At the request of the ELECTRICAL WORLD the following appreciation of Mr. Brown was prepared by B. A. Behrend of Boston, who has always been his great admirer and who for many years was associated with him in electrical machinery design:

"A few years ago, before this world of ours was turned into chaos by the events of the last ten years, the death of Charles Eugene Lancelot Brown would have been treated as an event of note and importance, and eulogies and obituary notices would have appeared not only in our engineering and scientific journals, but also in our daily press. But conditions have changed. We no longer take any more than passing notice of our great leaders, and their departure creates no more of a ripple in the turbulent sea of present conditions than does the ending of any other life. In this country we recently lost Steinmetz, who belonged to the same period and whose work was in the same field as that of Brown.

"Mr. Brown was born at Winterthur, Switzerland, on June 17, 1863. His father was a brilliant engineer, an Englishman who, if he did not invent, contributed very largely to the invention of the one-time famous Sulzer valve gear. Brown was twenty-two years old when he became chief engineer of the Oerlikon Tool & Engine Works, where his work soon attracted worldwide attention. Not only did his skill as a designer of electrical machines appear quite unusual, but also his enterprise, daring for the period, showed him to be a truly creative engineer. The line built by him to carry electrical energy at 2,000 volts, direct current, from Kriegstetten to Soleur, a distance of 5 miles, afforded one of the first examples, if not the first, of power transmission, though only 50 hp. was actually used. In 1890, inspired by Tesla's brilliant inventions, Brown threw himself into the development of alternating-current machinery—in particular, polyphase motors and generators. He was a close friend of the late Gisbert Kapp and of Michael Dolivo-Dobrovolsky, and the three men made up a brilliant trio all interested in or inspired by the same ideas.

"Brown developed in 1891 an induction motor which differed extremely little from the present type. He designed at that time the Lauffen type of single-coil alternating-current generator, which in 1891 was used in connection with the experiment of transmitting power of over 100 kw. from Lauffen to Frankfort at 30,000 volts. This power transmission forms one of the milestones in our industrial development. It will be indelibly associated with Brown's name and genius as long as men mark the advances in engineering as of importance to the human race.

C. E. L. BROWN

"At the close of 1891 Mr. Brown left the Oerlikon company to organize Brown, Boveri & Company, whose head he remained for many years until he retired about ten years ago. Here he developed also the Brown-Parsons turbine, and the story has it that during the early development of the steam turbine Mr. Brown called on Sir Charles Algernon Parsons and, seeing the somewhat crude attempts then under way, said to Sir Charles that he knew he could perfect the mechanical design to make it of greater commercial value. Whether this anecdote be true or not, he certainly perfected the Parsons turbine in a singularly successful manner.

"When Edward D. Adams, as president of the Cataract Construction Company, began to study the development of the power of Niagara Falls, Mr. Brown was consulted, and his plans and drawings, published by the writer in articles referred to below, showed a degree of vision which was many years later realized by engineers through a design of a very similar nature. Mr. Adams himself always felt that he had received great help from Mr. Brown's plans, although I do not recall that Mr. Brown was a member of Mr. Adams' commission, of which a countryman of Mr. Brown's—Colonel Turettini—the late Lord Kelvin and Professor Forbes were members.

"Mr. Brown's work was described in a series of papers in the ELECTRICAL WORLD from November, 1901, to March, 1902, by his friend and disciple, the present writer. The American Institute of Electrical Engineers took occasion to recognize Brown's achievements by making him one of the half dozen foreign honorary members. With him goes one more of the great figures who constructed the complex industrial cosmos in which we live."

American Electric Power Company Sold

Common Stock of Philadelphia Holding Organization Goes to American Gas & Electric and Appalachian Power Companies—About $8,900,000 Involved

RUMORS of the sale of the common stock of the American Electric Power Company of Philadelphia to the Electric Bond & Share Company, the Cities Service Company and Stone & Webster, Inc., were set at rest on Thursday of last week, when official announcement was made that the purchasers were the American Gas & Electric Company of New York and the Appalachian Power Company of Bluefield, W. Va. This statement was made by Van Horn Ely, president of the American Electric Power Company, who said that other interests probably would participate in the purchase. The Electric Bond & Share Company is not a party to the transaction, Mr. Ely said. He quoted S. Z. Mitchell, president of the Electric Bond & Share, as saying that this company had no interest whatever in Appalachian Power and had less than 3 per cent interest in the stock of the American Gas & Electric.

The price paid was $62.50 a share. The contract provides that within fifteen days certain representations by the vendors must be verified to the satisfaction of the purchasers, and that not less than 75 per cent of the common stock shall be deposited with the North American Bank & Trust Company of Philadelphia for delivery to the purchaser against payment. There are approximately 190,000 shares of common stock of the American Electric Power Company outstanding. At $62.50 a share the purchase of 75 per cent of the stock would require an outlay of about $8,868,000. Two months ago the shares were selling in the thirties.

The American Electric Power Company, formerly the American Railway Company, controls more than forty electric railway and light and power companies in Pennsylvania, New Jersey, Ohio, the Virginias, Kentucky, Delaware and Illinois. Among the companies under its control are the Wilmington (Del.) Light & Power Company, the Cape May (N. J.) Light & Power Company, the Monmouth Lighting Company, Keyport, N. J.; the Electric Company of New Jersey, Bridgeton, N. J.; the Boyd County Electric Company, Ashland, Ky.; the Chester County Light & Power Company, Kennett Square, Pa.; the Logan Light & Power Company, Tyrone, Pa.; the Consolidated Power & Light Company, Huntington, W. Va.; the Ironton (Ohio) Electric Company, the Lynchburg (Va.) Traction & Light Company, the Roanoke (Va.) Traction & Light Company and the Quincy (Ill.) Gas, Electric & Heating Company.

Supply Jobbers Hear Leaders in the Industry

How long the electrical jobbing business will be permitted to proceed under present conditions of inadequate compensation will depend upon the courage of executives, according to Gerard Swope, president of the General Electric Company, who spoke on Wednesday evening of this week before the annual summer convention of the Electrical Supply Jobbers' Association at Hot Springs, Va. The profits of the jobbing business have been inadequate, he said, probably because young men are impatient and because in this young industry insufficient attention has been paid to costs. Intensive methods of economy are now needed to reduce costs and broaden public service. Mr. Swope discussed at length the natural responsibility of the larger electrical manufacturers to promote the progress and prosperity of the industry because their interest is large and they are most affected by the condition of the electrical business. The price policy of the General Electric Company, he said, is to reduce costs to the American people as rapidly as it can be done, but where a line does not give adequate profit prices will not be decreased. In discussing distribution Mr. Swope said that nothing can do more to benefit the electrical jobbers in general than improvement in the efficiency and prosperity of those groups of distributors allied with the large manufacturers.

David Sarnoff, vice-president Radio Corporation of America, also addressed the Wednesday evening meeting, picturing the present status and trend of radio broadcasting and dwelling at length on the radio patents situation. A large number of electrical jobbers and manufacturers attended the convention. Addresses by J. E. Davidson, chairman Lighting Educational Committee; L. W. Davis, general manager Association of Electragists International, and A. C. Kimball, president Landers, Frary & Clark, were also on the program.

Seattle Tax Case Argued

Three judges in the United States District Court at Seattle took under advisement on June 2 applications of the Old Colony Trust Company and the Puget Sound Power & Light Company for temporary injunctions restraining the Sheriff of King County from selling the power company's holdings to satisfy street-railway taxes assessed for 1919. The details of the purchase by the city of Seattle from the power company of the street-railway lines were reviewed, as well as the court proceedings subsequent thereto and recent action taken to obtain payment of taxes. The Old Colony Trust Company received permission to file a supplemental bill, and motions of the defendants for dismissal in both cases were taken under advisement. James B. Howe, representing the power company, made the argument on its behalf indicated in last week's ELECTRICAL WORLD, page 1146. The Corporation Counsel of Seattle asserted that the city was not properly a defendant in the action and moved for dismissal. The intimation that the city and the county were in collusion to force the company to pay the entire taxes for 1919 was vigorously denied. Decision on the motion was deferred.

Month's New Light and Power Issues Total $56,766,000

DURING the month of May public sales of electric light and power securities amounting to $56,766,000 were offered by investment houses, a figure representing a decrease of more than $36,000,000 under April's total, but an increase of more than $4,000,000 over the total of the corresponding month of 1923. It is interesting to note that the volume of new securities for expansion purposes is far in excess of that raised for refunding purposes, refunding activities being almost a negligible factor in the month's financing. This trend has been apparent since the beginning of the year. Sizable issues during May were few, the largest single offering being the ten-million-dollar issue of the Southern California Edison Company offered at 90 and yielding 6.67 per cent. Though several short-term securities appeared, long-term financing predominated. The average yield was 6.37 per cent.

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN MAY

Name of Company	Amount of Issue	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
United Light & Power Co. (Ill.)	$3,500,000	35	First lien and consolidated mortgage gold bonds	To reimburse for construction, for additions and refunding	5½	90	6.20
Durham Public Service Co. (N. C.)	1,500,000	25	Refunding mortgage gold bonds, series A	Refunding, to reimburse for expenditures on addition and for other corporate purposes	7	99½	7.04
Great Western Power Co. of California	2,000,000	28	First and refunding mortgage sinking fund gold bonds, series C	To reimburse for capital expenditures	6	99½	6.03
Minnesota Electric Distributing Co.	200,000	1–10*	First mortgage gold bonds	Additions to present property and construction of additional plants	7	100	7
Northwestern Electric Co. (Ore.)	700,000	11	First mortgage sinking-fund gold bonds	Extensions	6	100	6
Carolina Power & Light Co. (N. C.)	1,300,000	29	First and refunding mortgage gold bonds	Construction and other corporate purposes	6	100½	5.95
American Gas & Electric Co. (N. Y.)	4,250,000	90	Gold debenture bonds (American series)	To reimburse for additions and other corporate purposes	6	94½	6.35
Binghamton Light, Heat & Power Co. (N. Y.)	501,000	22	First refunding mortgage gold bonds	To provide additional working capital	5	91	5.75
Louisville Gas & Electric Co. (Ky.)	3,000,000	30	First and refunding mortgage gold bonds, series B	To reimburse for expenditures on addition	5½	95½	5.80
New Jersey Power & Light Co.	465,000	12	First mortgage gold bonds	To provide additional working capital	5	91½	6
Public Service Co. of Colorado	3,000,000	1	Gold notes	To provide funds for purchase of stock	6	100	6
Southern California Edison Co.	10,000,000	..	Cumulative preferred stock	Additions	6	90	6.67
United Power & Light Corp. of Kansas	1,750,000	1–7	Serial debenture gold notes	To acquire new property, construction and for other corporate purposes	6 to 6½	97.94 to 100	6 to 6½
	1,350,000	20	Additional first mortgage gold bonds, series A		6	97½	6.20
Blackstone Valley Gas & Electric Co. (R. I.)	2,700,000	2	Gold notes	To finance interest in another utility, refunding and other corporate purposes	5	99.54	5.25
Northern States Power Co. (Minn.)	5,000,000	9	Gold notes	Construction	6½	97½	6.85
Knoxville Power & Light Co. (Tenn.)	500,000	..	Cumulative preferred stock	To reimburse for additions and for other corporate purposes	7	98	7.14
Portland Electric Power Co. (Ore.)	3,500,000	23	First lien and refunding mortgage gold bonds, series B	Construction	6	94	6.50
Southwest Power Co.	2,100,000	20	First mortgage gold bonds, series A, sinking fund	Acquisition of properties	6½	97½	6.75
United Light & Power Co. (Iowa)	1,000,000	50	Gold debentures	To reimburse for construction, additions and for other corporate purposes	6½	95	6.90
Nevada-California Electric Corp.	2,000,000	26	First lien gold bonds, series B	Construction	6	94½	6.40
San Joaquin Light & Power Co. (Cal.)	1,500,000	30	Unifying and refunding mortgage gold bonds, series C	Additions	6	99½	6.03
Northeastern Iowa Power Co.	200,000	1–2*	Serial gold notes	To pay in part purchase price of another utility and for stock	6	100	6
Ohio Power Co.	2,000,000	100	Gold debenture bonds, non-callable for twenty-five years	To liquidate current debt and for additional working capital	6	71	6.60
Youghiogheny Hydro-Electric Corp. (Md.)	2,750,000	25	First mortgage gold bonds	Construction	6	95	6.40
Total	$56,766,000						

*Due serially.

Pulverized Fuel Succeeds

A. S. M. E. Speakers Point to Results at Cleveland—Mercury-Vapor Plant is Live Topic

AT THE meeting of the American Society of Mechanical Engineers in Cleveland from Monday to Wednesday of last week one of the most interesting sessions was devoted to a discussion on the burning of pulverized fuel. A paper by W. H. Aldrich described the pulverized-fuel installation at the plant of the Cleveland Electric Illuminating Company. This installation does not use driers and has been operating about three months very satisfactorily. Acceptance tests are now being made on the boilers. Major Spencer discussed the paper and said the use of driers was advisable with pulverized-fuel installations because they increase the ease and the efficiency of operation. He also asserted that a 15-ton Raymond mill is in operation at the Cahokia plant of the Union Electric Light & Power Company of St. Louis and that two others will be placed in service soon. A 20-ton Fuller mill is also being installed which will use only 13.5 kw.-hr. per ton of fuel ground.

R. D. Wolf of Rochester, N. Y., said his experience indicated that when the moisture is 8 to 10 per cent the capacity drops off and that when using separately fired driers the amount of heat energy used in drying is greater than the heat lost in flue gases beyond the economizers. He stated also that an analysis of accidents in cement-mill pulverized-fuel installations showed that 75 per cent occurred because of the presence of driers or conveyors and that they usually occurred when repairs were being made. No conveyors are used in the Rochester installation.

G. Keeth said that experiments at Cahokia had shown driers to be necessary. The mills grind 5.7 tons to 6 tons per hour with 6 or 7 per cent moisture and use 19 kw.-hr. per ton of coal ground. On test with 3 per cent moisture the input was 11.7 kw.-hr. per ton and 7.9 tons was ground per hour.

When flue gases are used for drying, A. G. Christie maintained, the temperature of the flue gases must be kept above the dew point to avoid condensation and causing the coal to become moist. In order to prevent fires in pulverized-fuel installations it is also well to keep the CO_2 content high and thus smother incipient flames. Mr. Christie thought it advisable to use quite hot gases in the driers. Mr. Keeth said that initially the drier gases are 250 deg. F. at Cahokia, but gradually the temperature is pushed up to a value of 425 deg. F. and that no trouble is found if the coal is kept moving. The gases enter the drier at 425 deg. F. and leave at 200 deg. F. and the coal temperature is about 200 deg. The acceptance tests have been completed on the Cahokia station, although the computations are not entirely made. These tests were made on a boiler for eight days continuously, twenty-four hours a day, at no time at less than 140 per cent of rating and mostly at 160 per cent. For the last twenty-four hours the tests were made at 250 per cent of rating; still, the boiler was in good condition for operation and service. W. H. Aldrich said that pulverized-fuel installations, in his experience, were eminently adapted to take care of sudden fluctuations in load. Others commented on this same characteristic.

MERCURY BOILER EXCITES INTEREST

The presentation of an account of the mercury-vapor process by W. L. R. Emmet attracted a very large audience. Mr. Emmet outlined the development of the process and indicated that experimental conditions were pretty well finished and that in the near future there would be installed at the Hartford plant a re-designed boiler of the straight-tube type with calorized interior which was expected to work with about 70 lb. mercury pressure and a temperature of around 850 deg., thereby increasing very much the efficiency of the cycle. Joseph Pope gave some figures on the present installation and stated that in one test the boiler used 2,036 lb. of oil and produced 1,258 kw.-hr. of electricity and steam at the rate of 24,760 lb. per hour. The heating value of the oil was 18,534 B.t.u. and the temperature of the gas to the economizer 197 deg. F. The steam pressure was 188 lb. with 49 deg. F. superheat. This gave results of 1.63 lb. of oil per kilowatt-hour from the electrical standpoint and in addition an evaporation of 12.1 lb. of steam per pound of oil. Thus both from the electrical standpoint and the steam-boiler standpoint the installation has given remarkable results.

In the discussion which followed the papers the point was made that the mercury-vapor process as now being developed is essentially a constant-load process because the utilization of a large charge of mercury to take care of the requirements of sudden load fluctuations meant a rather prohibitive investment and difficulties in boiler design.

OFFICERS NOMINATED

Nominations for officers were announced as follows, election to be by ballot of the entire membership, closing on September 23: For president, William F. Durand, professor of mechanical engineering at Stanford University, California; for vice-presidents, Robert W. Angus of Toronto, S. F. Jeter of Hartford, Conn., and Thomas L. Wilkinson of Davenport, Iowa; for managers, John H. Lawrence of New York, Edward A. Miller of Cincinnati and Paul Wright of Birmingham; for treasurer, William H. Wiley of New York.

Colorado Program of S.P.E.E. Promises Well

Boulder, Col., will be the gathering place of the Society for the Promotion of Engineering Education this year, its thirty-second annual meeting being scheduled for June 25-28 at the University of Colorado. Among the papers to be presented are one on "The Meaning of the Bachelor of Science Degree in Engineering," by H. S. Evans, dean of the College of Engineering, University of Colorado; one on "The Student as an Individual," by Carl E. Seashore, dean of the Graduate School of Iowa State University, and one on "Fifteen Years of Experience with a Five-Year Engineering Curriculum," by W. H. Burger and J. F. Hayford of the Northwestern University, Evanston, Ill. Addresses will be made by the president of the society, Dean P. F. Walker of the School of Engineering, University of Kansas, whose subject will be "Public Service Aspects of Engineering," and by Frank Aydelotte, president of Swarthmore College, Pennsylvania. Director W. E. Wickenden will report for the board of investigation and coordination.

On June 26 there will be a mountain drive, with a "beefsteak fry" in Boulder Canyon, followed by a camp-fire smoker and round-table discussion. Abundant entertainment and opportunities for trips will be provided throughout the convention.

Utah Power & Light Company Makes Progress

The Utah Power & Light Company's annual report for the year 1923, recently issued, indicates a substantial growth of the territory served by the company and consequent extension of power facilities. There is shown a net gain of 3,541 electric customers during the year, to meet whose demands the company placed in operation an additional 11,000-kw. unit at its Grace hydro-electric plant. Work is under way on a new 14,000-kw. hydro-electric plant at Soda, Idaho, which is expected to be in operation in the late summer, and important improvements have been made in the Jordan steam reserve plant in Salt Lake City. The report further states:

"Further increases in power-plant capacity must be undertaken without delay, and with this in mind the company has secured from the Federal Power Commission a preliminary permit for the Flaming Gorge site on the Green River in Utah, and, if investigations show the development of that site to be practicable, it intends to seek a federal license covering the construction there of what will be one of the largest dams in the United States and of a generating station from which electrical energy can be produced annually equivalent to more than 40 per cent of the total energy produced by the company in 1923."

Another interesting feature of the report is the large growth shown in customer ownership of the company's 7 per cent cumulative preferred stock. The report states: "On December 31, 1923, these customer owners numbered 3,773 and held stock to the par value of $4,134,000, in addition to large local holdings of the company's bonds." From the first of the year to May 1 there has been an increase in sales of stock to customers of $698,900 par value.

The company's generating capacity at the end of 1923 was 166,787 kw., and the additional generating capacity under consideration was 34,000 kw. The company earned a surplus for 1923 of $614,550, which was made possible by the operation of all plants at maximum capacity under favorable water conditions.

Briefer News

Pacific Coast Jobbers Postpone Meeting.—The next quarterly meeting of the Pacific Coast Electrical Supply Jobbers' Association will be held at Del Monte, Cal., July 24 to 26. The meeting was originally scheduled for June 12 to 14 and was to have been held at Coronado. Closed meetings will be held on July 24 and 25, and the customary open meeting will be held on the morning of July 26.

Kentucky-Tennessee Company Buys More Plants.—In addition to its purchase of the electric plant at Martin, Tenn., already noted, the Kentucky-Tennessee Light & Power Company has bought plants at Dresden, Union City, Dyer and Sharon, Tenn., and is negotiating for others. The plants already purchased were all owned by the respective municipalities, which will now be served eventually over high-tension transmission lines to be erected by the central-station company.

Pacific Power & Light Company Cuts Yakima Rates.—Reductions of about 20 per cent in commercial lighting rates and a slight cut in last year's residential rate will result in an approximate saving of $40,000 to Yakima (Wash.) patrons of the Pacific Power & Light Company of Portland, Ore. The reduction is the second within eighteen months, representing a total saving of $70,000 to Yakima patrons and of some $180,000 to customers in the company's entire Washington territory.

Bettendorf, Iowa, to Have New Power House.—Plans for the erection of a new power house at Bettendorf, Iowa, to cost approximately $200,000 completely equipped, have been announced by the Bettendorf Company. A contract for two steam turbines and a rotary converter to cost about $100,000 has been awarded to the Allis-Chalmers Manufacturing Company of Milwaukee. Construction work will be started soon, and the power house is expected to be completed for installation of the new equipment in the fall.

Empire State Association, Commercial Section, Meets June 19.—The annual meeting of the Commercial Section of the Empire State Gas and Electric Association will be held at Buffalo and Niagara Falls in the respective auditoriums of the Buffalo General Electric Company and the Niagara Falls Power Company on June 19 and 20. Among the papers to be presented will be these: "Electricity in New York Agriculture," Prof. H. W. Riley, New York State College of Agriculture; "Gas and Electric Merchandise Display and Advertising." E. F. Newkirk, Edison Lamp Works; "Household Refrigeration," T. I. Jones, Brooklyn Edison Company, and "Establishment of Rural Lighting Districts," John Costello, Livingston-Niagara Power Company, Avon, N. Y.

Utica Gas & Electric Company's New Station.—Work is just starting on the Harbor Point station of the Utica (N. Y.) Gas & Electric Company, which will have an initial rating of 30,000 kw. in two Westinghouse units. Taylor stokers and Wheeler condensers will be installed, and the D. Connelly Boiler Company will furnish four boilers each capable of carrying a 12,000-kw. load. The ultimate capacity of this station will be 150,000 kw., and it will embody several interesting and perhaps some novel features. It is aimed to complete the first unit of the station by the fall of 1925.

Colored Electric Sign Uses 5,671 Bulbs.—Among the latest spectacular electric signs in the New York City theatrical district is one advertising a particular make of rugs. This sign is 44 ft. wide and 40 ft. high, but it appears to be still larger on account of its brilliant colors. In the sign a man unrolls a rug. After it is flat the colors in the rug change so that entirely different designs are shown. The carpet is made of four color combinations

and is 35 ft. wide at the bottom and 32 ft. 8 in. down the left side. The rug alone contains 3,396 10-watt electric bulbs with color hoods. Altogether the sign contains 5,671 separate electric bulbs.

Exports of Energy to United States Increase.—Ottawa advices say that Canada exported to the United States 30 per cent more electric power during the year ended March 31 than she did during the preceding year, the quantity being 1,400,231,340 kw.-hr., as compared with 1,054,872,000 kw.-hr. About 60 per cent of this was through the Niagara peninsula. Another 30 per cent was from the Cedars Rapids development on the St. Lawrence River. Another much smaller block went from the Rainy River district in northwestern Ontario, while from British Columbia a small amount trickled over the boundary line.

To Fight Electric Truck Tax in California Supreme Court.—Representatives of the electric truck industry in California are preparing to carry the case against the State Motor Vehicle Department in regard to the tax placed on electric trucks to the Supreme Court of the state. At present a tax of $50 is assessed on every electric truck operating in the state, and in a recent suit tried in the Superior Court the electric truck men claimed that the tax on the electric truck was discriminatory. In this suit, as already recorded in these columns, the decision was given against the complaining electric truck men.

Southern Colorado Power to Serve Las Animas.—Service will be supplied to the town of Las Animas, Col., by the Southern Colorado Power Company of Pueblo as the result of arrangements that have recently been completed. Twenty miles of 13,000-volt transmission lines will be built to connect Las Animas to the system of the Southern Colorado Power Company. The plant of the Western Public Service Company at Las Animas will be dismantled and the company will purchase its energy from the Southern Colorado Power Company. The new transmission line will connect with the Southern Colorado system at La Junta, and the expense of building the power line will be borne jointly by the two companies.

Power and Light Production in Porto Rico.—The business of the power and light division of the Porto Rico Railway, Light & Power Company showed a phenomenal growth last year, according to Frederick Krug, superintendent of power, the gross income for 1923 reaching almost a million dollars. An increase of 5,000 kw. in capacity is under immediate consideration. The matter is complicated by reason of the fact that the company has for three years been making a close study of a high-head hydro-electric development. Last year—an unusually dry one—the plants were operated 33 per cent on steam, and whether economy dictates a new steam unit, the proposed new hydro development or the installation of Diesel engines is a three-sided problem now being worked out.

South Carolina Schoolboy Wins Prize for Essay on Hydro-Electric Development.—In order to encourage a study of the water-power resources of South Carolina, the South Carolina Chapter of the American Association of Engineers offered some months ago a prize of $100 to the high-school boy of the state writing the best essay on the subject. L. M. Fisher of Columbia, president of the South Carolina Chapter, has announced that the prize has been awarded to Henry Fennell of Fairfax. A large number of contestants submitted essays and the competition was keen. The theme of the winning essay was the social and industrial progress of the state in relation to the utilization of water-power resources, and the essay pointed out the benefits to everyday life from increased employment of electric power in homes and industry, the growth therefrom of the small community and the civilizing results from the use of modern power appliances.

Havana Central Station Prospered in 1923.—In the annual report of the Havana Electric Railway, Light & Power Company for 1923, just received, a steady growth in the electric light and power department is recorded, gross earnings from operation increas-

ing from $5,372,756 in 1922 to $5,742,562, net earnings from $4,074,346 to $4,380,530, and output from 58,278,660 kw.-hr. to 63,237,376 kw.-hr. The company had at the end of 1923 68.45 miles of three-phase, 2,200-volt distribution lines and 11.05 miles of single-phase lines. Further progress was made in eliminating overhead lines from the narrow and congested streets in the business section. During the year 103 gas-filled lamps of 500 watts each were added to the street-lighting system, making a total of 1,898 lamps of this rating and 1,125 lamps of less power. The company owns twenty-seven electric trucks.

Two North Carolina Companies Are Merged.—The North Carolina Public Service Company, Inc., of Greensboro, N. C., is expanding and adding to its line throughout its territory. The company operates the utilities in Greensboro, High Point, Salisbury and other towns and retails power, which it buys for the most part from the Southern Power Company. The company has just purchased the property of the Piedmont Power & Light Company, operating throughout Alamance County. Properties in Gibsonville, Elon College, Burlington, Haw River, Graham, Mebane and adjacent territory are included in the deal, the estimated value of the property bought being about $1,500,000.

Minneapolis Has Electrical Board of Trade.—The Electrical Board of Trade of Minneapolis has been organized "to foster and promote harmonious relations within the electrical industry, to stimulate public interest in an increased use of electric service and to encourage a high standard of business ethics." All electrical interests in the city will be represented in the nine sections which will compose the association, control being vested in an executive committee containing two members from each section. The following officers have been elected: President, John S. Hogan; first vice-president, George P. Svendsen; second vice-president, Charles Arrick; treasurer, R. M. Laird; secretary, Leo Cooper.

Muskogee's 30,000-Hp. Plant Has Formal Opening.—The public opening of the new Riverbank electric generating station of the Oklahoma General Power Company, a subsidiary of the Oklahoma Gas & Electric Company, on the Arkansas River, 3 miles east of Muskogee, was held Friday, May 23, and proved one of the largest and most important intercity gatherings ever held in eastern Oklahoma. While the Riverbank plant has been in operation since early in the year, the final details were completed only recently. Many commercial and civic organizations participated actively, and newspapers throughout the state called attention to the importance of the company's construction program in furthering the prosperity of Oklahoma. The initial 20,000-hp. plant at Harrah, 23 miles from Oklahoma City, is expected to be ready for operation by fall. Upon the completion of the present construction program the total capacity of all the Oklahoma Gas & Electric Company's plants will be 86,925 hp. The company serves 369,000 people in seventy-seven cities and towns.

Americans Aid the Jordan River Water-Power Project.—The Rutenberg plant for harnessing the waters of the Jordan River to provide Palestine with light, heat and power is about to become an actuality, according to official announcement. This hydro-electric project is being financed in part by prominent Americans, including United States Supreme Court Justice Louis D. Brandeis, Federal Judge Julian W. Mack, Felix M. Warburg, Louis Marshall and Colonel Herbert Lehman. Baron Edmond de Rothschild of Paris, the Jewish Colonial Trust of London and the London Economic Board for Palestine, of which Sir Alfred Mond is the president, are the other groups participating in the financing of the undertaking. It is said that the American participation in the plan amounts to more than $500,000.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See January 5 issue, page 72, for latest list.]

American Association of Engineers—San Francisco, June 11-13. C. E. Drayer, 63 East Adams St., Chicago.

Canadian Electric Association—Ottawa, Ont., June 11-13. Louis Kon, 311 Power Bldg., Montreal.

North Central Division, N. E. L. A.—Winona, Minn., June 11-13. H. E. Young, Minneapolis General Electric Company, Minneapolis.

Pennsylvania State Association of Electrical Contractors and Dealers—Allentown, Pa., June 11.

Arkansas Utilities Association—Hotel Eastman, Hot Springs, Ark., June 12-14. R. I. Brown, Arkansas Central Power Company, Little Rock.

Associated Manufacturers of Electrical Supplies—Hotel Ambassador, Atlantic City, N. J., June 16-20. Frederic Nicholas, 30 East 42d St.

American Society of Civil Engineers—Pasadena, Cal., June 16-20.

Pacific Coast Electrical Association—Hotel Coronado, Coronado, Cal., June 17-20. S. H. Taylor, 527 Rialto Bldg., San Francisco.

Georgia Electrical Association—East Lake Country Club, Atlanta, June 18-19. W. C. Drake, 75 Marietta St., Atlanta.

American Society of Agricultural Engineers—Lincoln, Neb., June 18-20.

Empire State Gas and Electric Association—Commercial Section, Buffalo and Niagara Falls, June 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

Wyoming Utilities Association—Casper, Wyo., June 23-24. H. C. Chappell, Natrona Power Company, Casper.

American Institute of Electrical Engineers—Annual convention, Edgewater Beach (Chicago), June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 23-27.

Iowa Section, N. E. L. A.—Wahkonsa Hotel, Fort Dodge, June 24-26. M. G. Linn, Des Moines Electric Co., Des Moines.

National Council Lighting Fixture Manufacturers—Atlantic City, N. J., June 25-27.

Society for the Promotion of Engineering Education—University of Colorado, Boulder, Col., June 25-26. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Northwest Electric Light and Power Association—Gearhart Hotel, Gearhart, Ore., June 25-27. G. H. Guefroy, Pacific Power & Light Company, Portland.

American Physical Society—Stanford University, Cal., June 26.

Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 26-28.

Ohio Electric Light Association—Hotel Breakers, Cedar Point, Ohio, July 8-11. D. L. Gaskill, Greenville, Ohio.

East Central Division, N. E. L. A.—Cedar Point, Ohio, July 9. L. B. Herrington, Kentucky Utilities Co., Louisville.

Louisville Company Planning Sixteen Years Ahead.—The Louisville Gas & Electric Company, which is completing the boiler and smokestack installation for the additional 27,000-kw. turbo-generator at its Riverside power station, will when this unit is erected about six months hence be abundantly able to take care of the expected increase in its load for a long time to come, especially if to this output there be added 13,350 hp. which it may be able to obtain from the projected Dix River plant of the Kentucky Hydro-Electric Company. It is not believed, however, that Dix River production will average over 50,000 hp., and on most of this output there will be a prior call. The Louisville company, according to official statements, is planning for sixteen years ahead, when the city is expected to have a population of 400,000 and will need for its rapid industrial development several times its present generating capacity. The Riverside plant will reach its limit when the present enlargement is completed, and when further extension becomes imperative it will probably be made on the company's Beargrass gas-plant site, though there is no likelihood of any large electrical development there in the near future, despite local press stories to that effect.

Toledo Edison Company Will Acquire Three Small Utilities.—Sale of the Defiance Gas & Electric Company, the Swanton Light & Power Company and the Holgate Light & Power Company to the Toledo Edison Company as the result of negotiations extending over a period of four months has been arranged subject to the sanction of the Ohio Public Utilities Commission. The price for the group of properties is understood to be $2,507,500 in addition to the assumption of the entire bonded indebtedness of the Defiance Gas & Electric Company amounting to $1,500,000. The Holgate Light & Power Company is owned and operated by Douty & Son, electrical contractors, while the Swanton property is a subsidiary of the Defiance company, most of the stock of which is owned in New York. The merger will give the Toledo Edison Company four new power units—a steam and a hydro-electric plant at Maumee and a steam and a hydro-electric plant at Defiance. During eight months of the year the hydro-electric plant in the Auglaize River at Defiance generates more energy than can be consumed there, and the property includes a high-tension line to the outskirts of Toledo. The Defiance Gas & Electric Company claims as part of its assets a perpetual franchise in that city, but for more than a year has been operating without a contract for domestic and city consumption because of inabiity of the company officials and the Defiance City Council to reach an agreement. The business of the company has expanded rapidly in its Maumee district, which is suburban to Toledo.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

W. A. Jones New Treasurer of N. E. L. A.

William Alton Jones, who was elected treasurer of the National Electric Light Association at the recent convention in Atlantic City, has been identified with the Doherty interests continuously since he entered upon his business career in 1912. He spent the following nine years—1912-1921—at Joplin, Mo., serving as cashier, auditor, assistant secretary and treasurer of the Empire District Electric Company, the Ozark Power & Water Company, the Carthage Gas Company and the Webb City & Carterville Gas Company. In 1921 Mr. Jones was made a member of the executive committee of Henry L. Doherty & Company, with headquarters in New York, the office he occupies at the present time. In addition he is vice-president and director of the Doherty Securities Company and the Gas & Electric Securities Company and a director of the Central Ohio Gas & Electric Company, the Cities Service Company, City Light & Traction Company, Consolidated Cities Light, Power & Traction Company and Fremont Gas, Electric Light & Power Company and is an officer and director in many commercial and industrial concerns. Mr. Jones has been an active member of the National Electric Light Association, being at the present time, as well as treasurer, chairman of the Accounting National Section. He was born in Webb City, Mo., and after completing the courses at the public and high schools of his native city attended Vanderbilt University, Nashville, Tenn.

W. A. JONES

Fred E. Shornstein has been appointed manager of the investment department of the Central Indiana Power Company, Indianapolis. Several years ago Mr. Shornstein was connected as power salesman with the Merchants' Heat & Light Company, a subsidiary of the Central Indiana Power Company.

Fred L. Hunt, chief engineer of the Turners Falls Power & Electric Company, with headquarters in Greenfield, Mass., was elected president of the Engineering Society of Western Massachusetts at its recent annual meeting.

J. B. French, who for the past two years has been district manager for the Arkansas Utilities Company at Brinkley, Cotton Plant and Clarendon, Ark., has been transferred to Marlin, Tex., as group manager for the same company.

R. D. Beard, formerly secretary and treasurer of the Fort Smith (Ark.) Light & Traction Company, is now connected with the Northern States Power Company as supervising auditor with headquarters in Minneapolis.

R. F. Harrison, formerly connected with the Helena office of the Arkansas Utilities Company, and more recently identified with the Fordyce office, has been appointed manager of the company's Brinkley plant, succeeding J. B. French, transferred to Marlin, Tex.

Howard W. Palmer, for many years a member of the editorial staff of the Watertown (N. Y.) *Daily Times*, has assumed the duties of assistant secretary to the Public Service Commission of the State of New York. Mr. Palmer will assist the secretary in the preparation of news reports of hearings and decisions of the commission.

Patrick C. Lynch, who has been connected as salesman with the Cornelia office of the Georgia Railway & Power Company, has been promoted to the position of superintendent of the Conyers district, recently formed through the purchase of the Panola Light & Power Company by the Georgia company. Mr. Lynch was previously identified with the company's Atlanta office.

Daniel W. Snyder, Jr., who has been general manager of the properties of the Illinois Power & Light Corporation at Bloomington, Ill., since 1916, has been promoted to be vice-president and a director of the Illinois Traction System with headquarters at Springfield, Ill. Mr. Snyder is well known in public utility circles in the Middle West and during 1923 served as president of the Illinois State Electrical Association. He assumed the duties of his new office on June 1.

Major H. S. Bennion, assistant chief engineer of the Federal Power Commission, will make an inspection trip during the current month in connection with several of the projects before the commission. He is planning to visit the projects of the Fresno and Merced irrigation districts in California and of the Utah Power & Light Company on the Green and Bear Rivers and will look over the work which the city of Sacramento has done on the American River.

H. M. Edwards Elected to N.E.L.A. Executive Committee

H. M. Edwards, who was elected a member-at-large of the executive committee of the National Electric Light Association at the recent convention in Atlantic City, has been auditor of the New York Edison Company since its organization in 1901. Mr. Edwards is a native of New York City and attended its public schools and the College of the City of New York. He entered the electrical industry in 1889 as bookkeeper for the Manhattan Electric Light Company and its affiliated company, the Harlem Lighting Company. After serving in this capacity for three months and later as auditor, he was elected secretary and made a director of the two companies. In the fall of 1895 Mr. Edwards was appointed auditor of the Edison Electric Illuminating Company, which four years previously had purchased the Manhattan and Harlem companies, and which four years later merged them. In addition to his duties with the merger company he assumed the responsibilities of auditor of the New York Gas, Electric Light, Heat & Power Company soon after it was organized, serving these two companies until the New York Edison Company was formed out of their consolidation in 1901. Mr. Edwards has always taken a prominent part in the development of the accounting departments of public service companies and has contributed a number of papers to the proceedings of the National Electric Light Association and the Association of Edison Illuminating Companies.

H. M. EDWARDS

Lafayette Hanchett, president of the Utah Power & Light Company, Salt Lake City, has been elected a director of the United States Chamber of Commerce. Mr. Hanchett, who is a leading figure in the financial and industrial activities of the West, will represent

the eighth geographical district of the national chamber, including Utah, Idaho Colorado Wyoming, Montana, Arizona, Nevada and New Mexico. His close contact with commercial affairs will enable him capably to represent the business interests of the Intermountain section.

L. G. Fields, formerly commercial superintendent of the Georgia Railway & Power Company at Gainesville, has resigned to enter the employ of the Western Electric Company at Atlanta.

Bert G. Clark of Indianapolis has been appointed district manager of the east-central territory of the French Battery & Carbon Company, Madison, Wis.

L. P. Graner has resigned his position as electrical engineer of the Electrical Specialty Company, Stamford, Conn., to affiliate himself with the Sprague Safety Control & Signal Corporation, New York.

J. L. Phillips, formerly manager of the Atlanta office of the Okonite Company Passaic, N. J., has been appointed manager of the company's San Francisco office.

Thomas A. Crossan, recently chief engineer of the Ponce Electric Company, Ponce, Porto Rico, has been transferred to the Pensacola (Fla.) Electric Company in the capacity of chief engineer.

H. L. Kneisly, formerly assistant to the chief engineer of the J. G. White Management Corporation, New York, has recently become consulting engineer for the Associated Gas & Electric Company, with offices in Oneonta, N. Y.

W. A. Tripp, formerly with the General Electric Company at Lynn, Mass., has joined the electrical division of Stone & Webster, Inc., Boston.

M. L. Hazelton, formerly with Day & Zimmermann, Inc., Philadelphia, has joined the structural division of Stone & Webster, Inc., Boston.

George N. Brown has been appointed manager of the Atlanta office of the Okonite Company, Passaic, N. J., succeeding J. L. Phillips, recently transferred to the San Francisco office.

J. E. Harrall, for a number of years superintendent of power distribution of the United Railways & Electric Company of Baltimore, and more recently identified with the George Construction Company of Philadelphia as vice-president, has become associated with the sales department of the U. G. I. Contracting Company of Philadelphia.

Marcus A. Curran, manager of the Western Electric Company at Cincinnati, recently left that office for New York to become a member of the general staff of the Western Electric Company as manager of central-station sales. Mr. Curran has been in Cincinnati since 1921 and before going there was a representative of the company in a number of cities in various parts of the country.

Emery F. Holt, assistant sales manager of the Bates Expanded Steel Truss Company of Chicago, has resigned to become manager of the Transelectric Company, Chicago. This company is specializing in transmission and distribution equipment and represents several large manufacturers, principally the Lapp Insulator Company. Previous to his association with the Bates organization, Mr. Holt was sales engineer for the Electric Appliance Company.

Hal R. Drew of Seattle has been appointed Northwestern representative for the Square D Company of Detroit, with headquarters in Seattle.

W. E. Clement, new-business manager of the New Orleans Public Service, Inc., was recently re-elected president of the New Orleans Electrical League.

G. W. Turner, agent for the Pacific Power & Light Company at White Bluffs, Wash., has recently been appointed district manager at Pomeroy.

Henry Harseim, formerly president of the Eastern Electric Construction Company, Ltd., has been elected vice-president of the Causbey Engineering Company, Inc., Philadelphia.

W. W. Grainger, formerly assistant sales manager with the Peerless Electric Company, Chicago, has been appointed district manager of the Master Electric Company in Chicago.

H. W. Cooper, manager of the Dayton-Waitsburg district of the Pacific Power & Light Company, has been appointed manager at Pasco-Kennewick.

Ralph Cake, who has been transmission engineer for the last year and a half with the Pacific Power & Light Company, Portland, Ore., has been appointed salesman for the Pacific States Electric Company at Portland.

Fay Pierce, formerly manager of the small-motor department of the Southeastern office of the General Electric Company, has been appointed power sales engineer of the Georgia Railway & Power Company.

Harry Stoy has been placed in charge of the power apparatus and line-material sales in the Atlanta office of the Western Electric Company. Mr. Stoy was formerly with the Carter Electric Company, Atlanta.

H. C. Couch, president of the Arkansas Light & Power Company, Pine Bluff, Ark., has been elected to the board of directors of the Simmons National Bank in Pine Bluff.

Dean W. Taylor, formerly connected with the Terre Haute office of the Central Indiana Power Company, is now serving as power engineer for the subsidiaries of that company, with headquarters in Indianapolis.

Allen H. Babcock, electrical engineer of California, has been named by the President as a delegate to the sessions of the International Committee on Electrical Communications to be held this year in Mexico City.

P. F. Hodgkins, formerly superintendent of distribution of the Pawtucket division of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., has been appointed superintendent of transportation in this company.

J. F. Fitzgerald, Jr., purchasing agent of the Staten Island Edison Corporation and the Atlantic Coast Electric Railroad Company for the past four years, has recently affiliated himself with Porter & Ross, manufacturers' agents of New York. For six years previous to his connection with the Staten Island and Atlantic Coast companies Mr. Fitzgerald was identified as purchasing agent with the Metropolitan Engineering Company.

I. W. Lamar, formerly identified with the West Penn Company at Pittsburgh, has been appointed assistant to the chief engineer of the J. G. White Management Corporation, New York, succeeding H. L. Kneisly, who was recently transferred to Oneonta, N. Y.

Carl A. Becraft, superintendent of the Hardin (Mont.) Electric Light & Power Company for the past three years, has resigned to become superintendent of utilities at Miles City, Mont. Mr. Becraft will have charge of the electric, water and heating plants.

Albert A. Miller, who for the past forty-two years has been superintendent of plant of the Fort Plain (N. Y.) Gas & Electric Company, has resigned, effective June 1. Mr. Miller will be succeeded by I. G. Smith of Sidney, N. Y.

Fred A. Mulvaney, formerly associated with the Pacific States Electric Company at Portland, Ore., is now connected with the Electric Sales Service Company, Berkeley, Cal., in the capacity of sales manager. Mr. Mulvaney has been connected with the sales force of the Pacific States Electric Company for eight years, most of which period was spent in the Northwest.

R. E. Meisner has been appointed treasurer and manager of the Jennings Utilities Company, Inc., Jennings, La.

J. G. Allen, formerly with the Foundation Company of New York, has joined the structural division of Stone & Webster, Inc., Boston.

L. R. Pietzsch has been appointed city manager of Beaumont, Tex., succeeding George J. Roark, resigned. Mr. Pietzsch, who is a graduate engineer, was formerly connected with the Water, Light & Power Company of Cameron, Tex., and for the past several years has been president of South Park College, Beaumont.

Obituary

John E. Harvell, manager of the Richmond-Petersburg division of the Virginia Railway & Power Company, Richmond, Va., died recently at his home in Petersburg following a long illness. Mr. Harvell had been identified with the electrical industry for thirty-seven years, starting as a lineman with the Upper Appomattox Company, a pioneer in the development of water power. A few years later he was promoted to the position of assistant superintendent, subsequently being made superintendent of operations. In 1909, when the Virginia Railway & Power Company was organized he continued in charge of the operation of the interurban and Petersburg railways that were taken over and later assumed supervision of the company's light and power properties at Weldon and Roanoke Rapids, N. C. He was appointed general superintendent of all the light and power divisions of the system in 1918, assuming in addition three years later general managership of the Richmond-Petersburg division.

Commission Rulings

Determining Reasonableness of Rates.—In fixing a schedule of rates for the Northwestern Ohio Light Company to apply in the village of Leipsic the Ohio Public Utilities Commission made the following rulings: The reasonableness of rates established by ordinance for a ten-year period should be decided by considering the utility's actual experience during a part of the period covered by the ordinance prior to the determination, as well as estimates based upon experience prior to the ordinance. The actual cost of fuel purchased by a utility should not be rejected as an operating expense in the absence of a showing of abuse of discretionary power by the management. The rates of a utility which has been ordered to construct a transmission line for improved and more economical service should be fixed for the period before the completion of the improvement upon the basis of actual cost during that period. An annual charge of 5 per cent of the value of the depreciable property of the utility was considered reasonable for the depreciation reserve, and an annual return of 8 per cent on the value of the utility was also approved.

Identity of Purchaser and Seller as Affecting Fairness of Sale of Capital Stock.—The New York Public Service Commission, affirming on rehearing its refusal to authorize the issue of 8,100 shares of the common stock of the Northern Light & Power Company in exchange for 2,159 shares of the Malone Light & Power Company of the same par value and authorizing instead the purchase of the Malone company's stock at $301,300 as compared with $810,000, the sum involved in the application, declared that the duty of the commission is to prevent overcapitalization which may injuriously affect the public either as investors or as consumers by the imposition of excessive rates. A holding corporation, the commission continued, should not be permitted to purchase the stock of a public utility by issuing four shares of its stock for each share of the utility's stock unless the stock is worth four times the par value of the stock of the holding company. A contention that the issue of an excessive amount of stock for the acquisition of stock of a public utility will not affect the public to its injury because rates cannot be affected by the price paid is not tenable, asserted the commission, which on this point made the following observations: "Here there is an absolute identity of purchaser and seller. The value fixed is not one arrived at between an independent seller and an independent buyer, but is what the stockholders of the Malone Light & Power Company think their stock is worth. When a utility has made a bargain for property that it deems necessary for the purpose of its business without community of interest between it and the seller, the price agreed to be paid therefor should have weight with the commission in determining its values. But here the case is different. The petitioners have attempted to fix a value of their property upon the basis of its earning capacity at $30 per electric horsepower per year for the Chasm Falls plant. Upon the rehearing evidence was given that electric power is sold per horsepower in some instances as high as $40 per horsepower and in other instances and localities as low as $12.50 per horsepower. The rates for horsepower usually involve other elements which affect the actual amount paid. This is illustrated by the contract between the Malone Light & Power Company and the Malone Paper Company, where the contract price expressed is $17 per horsepower. This is at the rate of $17 per horsepower with 100 per cent load factor and is measured by the average peak current used per month and ascertained weekly. In the year 1921 the peak consumption of the paper company was 13,133,536 kw.-hr., at the rate of $17 per horsepower, or 2.9 mills per kilowatt-hour. Its actual consumption, however, was 8,671,800 kw.-hr. or at the rate of $27.49 per horsepower, or at the rate of 4.2 mills per kilowatt-hour, and in 1922 the actual consumption was 9,392,000 kw.-hr. or at the rate of $25.84 per horsepower. So that as this consumer increases its actual use of electrical energy it reduces the price per horsepower. This consumer takes over 60 per cent of the output of the Malone company, for which it paid in 1922 less than $26 per horsepower. Despite this fact it is contended that valuation should be made on a capitalization of $30 per horsepower."

Recent Court Decisions

Transmission Lines Built Across Public Lands by Government Authority Cannot Be Forced Off.—Patentees of public lands across which power transmission lines have been constructed under authority and regulations of the Secretary of the Interior cannot eject the corporation owning such lines from the land according to a decision of the United States Supreme Court handed down last week by Justice Butler. The decision upholds the authority of the Secretary of the Interior to make reservations in granting patents to homestead entries. The case was that of the Washington Water Power Company against John Swendig and others, the decision of the lower courts being affirmed. The court said: "Under the permission of the Secretary, the power line had been constructed and was maintained on the right-of-way over the lands in question for a long time before the reservation was opened for settlement. The entries were made subject to the regulations then in force, and were affected by the provision 'that any permission granted hereunder is also subject to such further and future regulations as may be adopted by the department.' The fact that the patents did not have thereon a notation of the prior permit is not controlling. Under the regulation then in force final disposal did not revoke the permit, but was made subject to the use of the right-of-way for the power line. It was intended that the patent should not extinguish the earlier permission given by the Secretary. The issuing of the patents without a reservation did not convey what the law reserved. They are to be given effect according to the laws and regulations under which they were issued."

Company Entitled to Reimbursement for Losses Inflicted by Confiscatory Rate Order.—In its adjudication of the suit brought against the Alabama Public Service Commission (Patterson et al.) by the Mobile Gas Company, which sought the annulment of certain rate orders issued by the commission, the United States District Court for the Middle District of Alabama said with reference to the company's loss from orders found confiscatory: "This loss having been imposed by the direct action of the commission in compelling the plaintiff to continue to operate at a confiscatory rate, the company is entitled to reimbursement of these losses, which should be permitted by amortizing them over a period of five years." (293 Fed. 208.)*

Powers of Arkansas Corporation Commission Confirmed.—Reversing a decision of the lower court which (in Clear Creek Oil & Gas Company vs. Fort Smith Spelter Company) upset rates established by the Arkansas Corporation Commission, the Supreme Court of Arkansas said: "The establishment of rates is the making of a rule for the future and is, therefore, an act legislative in character, whether exercised by the Legislature itself or by some subordinate body created for that purpose by it. Therefore, the power of the commission to establish or change rates is continuous, and an application of either party showing a material change in the conditions from those existing at the time the rates were established will be ground for new action in the premises by the commission." (255 S. W. 903.)

In Prescribing Fair Return to Utility It Is Immaterial that Increased Rate Would Be Burdensome to Consumers.—The United States District Court for the West District of Missouri rendered a decree for the plaintiff in Joplin Gas Company vs. Public Service Commission, a suit to set aside a rate order as confiscatory. The court said that under the rule that the present fair value of the property of a company used in the public service must be taken as the basis for fixing rates the company is entitled to such value, even though it has been increased as the result of enhanced prices. A commission order will be considered from the standpoint of the period with which it deals. The court observed further that a contention that an increase in rates would be unjustifiably burdensome to consumers has no weight in the determination as to what will bring a fair return to a public utility. (296 Fed. 271.)

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*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

Engineering Aspects of Jobber Service

Technical Problems Are Increasing in Number and Importance—Better Applications of Apparatus and Material the Goal

By W. J. Keenan
Vice-President Pettingell-Andrews Company, Boston, Mass.

THE rapid and extensive growth of the electrical industry in recent years has taxed the resources of sales organizations in many ways. The multiplication of materials and supplies and the increase in variety and range of equipment available to the purchaser have forced widespread expansion of manufacturing and distributing facilities, and in the latter connection the jobber has met and overcome numerous difficulties. Sales personnel in particular have been developed to serve the trade better, and as the jobber has taken on lines requiring more and more technical skill in application the influence of the engineer has become more apparent in the wholesaler's organization. We shall see still further appreciation of technical knowledge in this branch of the industry in the future.

Protection of Customer

To the jobber as well as to the manufacturer and the central station it is very important that the consumer's needs be met along electrical lines with intelligence and economy, cutting out excess costs above the reasonable expense of furnishing the required apparatus, material and service. It is not enough for the jobber to buy electrical commodities and to catalog, stock and sell them with little regard for their fitness in particular cases. Engineering scrutiny of quality is appropriate before acceptance for stock, and the jobber who is willing to buy and sell supplies with little comprehension of commodities from the engineering standpoint runs no small risk of unloading material of dubious value upon the market, with an inevitable reaction at some later time against his house and its poor service. Of course, I do not mean that every shipment from the factory to the jobber's storehouse demands individual engineering tests or study, since established manufacturers with whom a house has long maintained close and satisfactory relations stand back of their products. But at some time during the building-up period in every line of supplies flowing into the trade, as that period affects the jobber, engineering judgment should be called into play before the stockroom is thrown wide open and the prestige of the house is thus automatically stamped upon the material.

This engineering judgment may be applied by the jobber's purchasing department to no little advantage in buying both bulk material, like wire, cross-arms, flexible metallic conduit, etc., and supplies embodying more designing, such as hardware for outdoor high-tension substations, molded insulation, wiring devices and automatic switches. As the material of electrical construction increases with inventive skill on the part of the manufacturer, it will be more and more necessary for the jobber to rely upon engineering analysis in selecting that best adapted to different purposes. Otherwise the jobber's knowledge of his lines will become more or less superficial, wholly apart from the study the ultimate consumer or his agent may or may not give to the commodities.

Illumination an Example

Given a seasoned line of supplies, material or equipment, the jobber still finds growing use for engineering ability in his sales staff. The illumination field is of interest in this connection. The jobber selling fixtures for industrial or mercantile service often is called upon to advise in regard to the number, type, heights, spacing and adaptability of such units. If the prospective purchaser employs engineering advice or obtains it from the central station or the contractor, it is still helpful for the sales engineer of the jobber to co-operate with other technically qualified people in obtaining a decision on the part of the customer to put in a first-class installation.

The jobber's sales engineer often has superior opportunities to study varied installations, and his close contact with the manufacturer is also useful. Few contractor-dealers can take the time to maintain a manufacturer contact of this kind. While the jobber's sales engineer is naturally keenly interested in placing his own lines in service, his experience and judgment should be turned to good account in the determination of even highly competitive sales problems.

Radio Also an Example

The value of engineering, or perhaps I might say of technical knowledge, in the wholesaling of radio apparatus need not be discussed at length. Without this it would be hard indeed to purchase and market such apparatus satisfactorily from the financial standpoint, owing to the temptation to overbuy as marked improvements are announced. Customer contact is obviously strengthened as the wholesaler's technical information and general engineering grasp of radio broaden.

In the past some people have not realized that the jobber had much in common with the engineer; but as time passes the old conception of the wholesaler as a sort of glorified stock clerk will give way completely to a wider appreciation of his responsibilities. It is logical that the sale of supplies and of equipment to the electrical industry, resting as it does upon a firm engineering foundation, should draw more and more from the engineer himself in its efficient development. As the industry

goes forward to better service to the public in all its branches, a closer relationship between the engineer and the jobber will be one of the powerful factors in its lasting success.

Simplifying Fittings in Apparatus Development

USERS of carefully designed electrical apparatus who specify departures from standard designs seldom have much idea of the complication this course often throws upon the manufacturer. Progress would stop if only standard products were purchased, but in manufacturing circles it is widely held that specific and well-considered reasons should be forthcoming in order to warrant the development of apparatus of special character. Controller manufacturers claim that this condition is particularly flagrant in their branch of the industry. When engineers specify the details of control equipment they seldom realize the high cost of manufacture involved. An example of the cost of even a slight modification in the design of a portable load box is of interest in this connection.

In the developmental period of this apparatus it was found that by the use of an aluminum frame and resistor material woven into asbestos sheets the weight of the box could be reduced to about 3 lb. The selection of a proper plug design then came to the front, and it was found that to develop a plug with recessed terminals so that contact pins could be used on the load box, something like two months of work at a cost of hundreds of dollars for designing and trial fittings would be required. There would be little or no opportunity to produce short circuits in using the device with the recessed plug. At this time the manufacturer was otherwise in a position to turn out 10,000 load boxes in short order. Had production got well under way the cost would have doubtless been far greater.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

ALTHOUGH business in the electrical industry has receded somewhat, the volume is still holding up satisfactorily, and judging by the number of quotations requested, increased activity is certain. Just when this increased activity will be reflected in orders is not known, but the basic and financial conditions are sound and the present situation can be classed as indicating an attitude of hesitation on the part of buyers rather than a recession of business. The general opinion is that business should show a small upward turn during the month, gradually increasing by the fall. It is evident that the uncertainty of the presidential situation has created a generally cautious feeling. This should be somewhat mitigated at the end of the conventions which are to be held in June.

Difference of opinion is reported by jobbers on the business being transacted, the sales of some prominent houses being equal to last year's while others show a falling off of from 8 per cent to 20 per cent. A large manufacturer of appliances reports that central stations are the best buyers, while jobbers and dealers are only maintaining their stocks. The building outlook is good, and it is confidently believed that any reduction of sales will be offset by the natural increase in demand for the year, while the total volume of business transacted during this year is expected to be slightly below that of 1923.

There is a fair volume of business in New England, although orders are fluctuating widely in value. Line material is being purchased in large quantity by central stations and the building industry is using much wire and many wiring devices. In the New York district the volume of business is still good, although sales are reduced. Increased inquiries and a growing interest are noticeable in the market. While the Southeast reports a decrease in business, the general impression in the industry is that underlying conditions are good. Weather conditions in that district have been unfavorable to crops as well as business. Trade is felt to have taken an upward turn in the Middle Western district, and several large construction contracts are reported as having been placed. The demand for high-tension equipment has been particularly good. On the Pacific Coast business in the San Francisco district is holding up well, but it is perceptibly slower in southern California and elsewhere.

Elevator Demand Now Slow—Was Very Good Earlier in the Year

DURING last January and February, when elevator business is naturally slow, there was a very good demand so that the slow period that now follows was more or less expected.

For the past year and a half many manufacturers have had their shops running to full capacity. The demand for elevators is so closely paralleled by building construction that the state of one can be taken as an index of the other. However, as the outlook in the building industry for the next six months is very good indeed, manufacturers are looking forward to an increase in their business. In the textile districts, where many mills are closed, little demand exists from industries which are normally good purchasers, and manufacturers serving these mills are waiting for conditions to improve.

As large contracts for elevators are usually awarded at the same time that general building contracts are let or approximately so, ample time is afforded for production of the equipment and nearly every one is able to give prompt delivery, especially in view of the normal amount of business which is at present available. More trouble is experienced in the delivery of elevators in buildings, which in a great many instances are not going ahead so rapidly as was expected. This forces the manufacturer to provide facilities for storing his products when completed. In the case of small elevators, which are often ordered for quick shipment, it is necessary to provide an unusual amount of stock in order to make deliveries. In most other cases elevators are made up to order to meet the requirements of every job. Deliveries are therefore limited by the ability to assemble the elevator to meet the necessary requirements. The delivery of motors and control equipment is sometimes the limiting feature in obtaining a complete elevator.

The price trend is in general downward because of the necessity of greater economy throughout all lines of business and the consequent effort which every one is making to meet this economical demand. However, no price changes are expected at present as there is no possibility of a reduction of prices of material, nor is any reduction in the cost of labor foreseen.

Electric Sign Business Responding to Active Sales Efforts

ALTHOUGH this is the beginning of the quiet season in electric sign making, the business has not fallen off seriously in the more progressive communities, and manufacturers believe that if improved central-station cooperation is forthcoming this summer, an excellent fall trade will be enjoyed. The widespread slackening in business in many parts of the country has resulted in a drop of perhaps 15 per cent or 20 per cent in sales compared with this time last year, according to a prominent manufacturer. In this establishment the cost of labor has been increased this year by a wage advance of about 15 per cent, and this additional cost is naturally being figured in bids.

Prices of electric signs must constantly be prepared on the basis of engineering estimates, so that it is difficult to characterize trends as in dealing with commodities produced in mass. Many raw materials enter into the cost of the modern electric sign, and the prices of these to the sign builder have fluctuated considerably of late. The larger builders are taking advantage of carload prices on steel, and the discounting of bills is practiced to some extent, even under present conditions.

Aside from the growing demand for mercantile signs, there is evidence of a more general interest in electric signs for factory display advertising on roofs or fronts facing traffic highways. In many places industrial plants and sign manufacturers are getting together to capitalize the advantages of factory location, which naturally results in increased business.

There is a decided tendency toward the use of 25-watt lamps in place of the 10-watt size in the larger signs. A survey of the sign field indicates that more active co-operation in selling such equipment on the part of the central-station company will be helpful to all interests concerned, and an encouraging step forward has of late been taken in this direction by some of the more progressive and energetic utility organizations.

Metal Market Quiet but Firm—Lead Stronger but Scarce

PRICES of metals have been well maintained during the last week, although the demand has not been large. This is attributed principally to the strength of the London market. Practically all producers of copper have been willing to sell at 12¾ cents delivered for June and July. Although sales have been unusually small and in small lots during the last few days, there has been little pressure to sell so that there has been no weakening of prices.

Lead appears to have reached its lowest price, but the official contract price of the American Smelting & Refining Company remains at 7 cents, New York. As much as 7¼ cents is being asked for lead, and while no sales of importance have been made at this figure, the tonnage available at 7 cents is very limited.

There has been little consumer demand for zinc. Sales, made mostly to dealers, have also been light.

Large buyers of tin are confining their orders to minimum carloads for prompt delivery, and there is little demand even at the present low price.

NEW YORK METAL MARKET PRICES

	May 28, 1924 Cents per Pound	June 4, 1924 Cents per pound
Copper, electrolytic	12¾	12¾
Lead, Am. S. & R. price	7.00	7.00
Antimony	8½	8¼—8½
Nickel, ingot	27	27
Zinc, spot	6.20	6.10
Tin, straits	42	41¾
Aluminum, 98 to 99 per cent	28	28

(Original Data Supplied by the Bureau)

Principal Exports of Switches, Circuit Breakers, Watt-Hour Meters, Lightning Arresters

	Switchboard Panels, Except Telephone		Switches and Circuit Breakers Above 10 Amp.		Fuses and Fuse Blocks		Watt-Hour and Other Measuring Meters		Voltmeters Wattmeters and Ammeters, etc.		Lightning Arresters and Protective Devices		Motors Under 1 Hp.	
	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars
1 Belgium	109	5,137	1,480	17,788	19,123	3,553	20	1,811	1,270	8,429	809	2,496	523	12[illegible]
2 Denmark					4,330	356	1	106	89	2,212			5,628	47.2[illegible]
3 Finland							1	48	5	33			32	[illegible]
4 France	8	1,197	9,045	281,077	3,962	744	67	2,275	5,551	20,444	4,458	63,639	738	22.[illegible]
5 Germany	1	760	1	19	1,145	225	1	126	31	573			666	40.[illegible]
6 Italy	3	782	1,781	13,280	5,042	1,548	869	5,129	9,171	35,891	529	2,256	1,816	26.3[illegible]
7 Netherlands	20	3,616	552	7,209	1,090	343	20	493	321	11,147	100	49	586	14.[illegible]
8 Norway			16,189	18,228	336	524	15	414	56	1,688			437	9.[illegible]
9 Spain	10	1,803	11,572	20,506	3,640	3,590	25	2,514	538	12,618	296	15,702	2,460	63.[illegible]
10 Sweden	3	410	17	200	409	90	11	279	154	4,437			114	4.[illegible]
11 Switzerland			6,125	6,863					253	505			485	7.[illegible]
12 England	378	24,008	74,201	69,181	34,150	7,885	313	10,190	1,195	100,560	3,405	13,189	17,924	359.[illegible]
13 Scotland									3	413			23,538	268.[illegible]
14 Ireland	18	2,799			100	110			2	170			2,001	19.[illegible]
Canada:														
15 Maritime Provinces	12	1,119	825	5,701	15,005	1,388	18	580	561	3,953	157	1,141	93	1.[illegible]
16 Quebec and Ontario	2,648	56,581	152,291	269,408	1,397,687	75,35[illegible]	4,379	88,610	23,715	142,017	13,656	46,935	37,533	444.[illegible]
17 Prairie Provinces	37	4,134	4,012	13,015	48,102	2,345	193	3,830	1,016	11,585	1,098	1,744	407	8.[illegible]
18 British Columbia and Yukon	17	2,662	6,083	11,751	55,961	1,468	48	1,234	312	2,632	417	3,435	202	5.[illegible]
19 Costa Rica	1	406	1,397	1,775	2,725	437	1	40	73	1,036	102	714	13	[illegible]
20 Guatemala	14	6,175	1,134	3,404	4,640	515	10	87	13	545	121	468	39	[illegible]
21 Honduras	14	5,433	948	1,513	16,967	2,038	146	2,294	144	1,824	129	915	43	[illegible]
22 Nicaragua	3	1,787	267	189	2,154	499	175	1,816	127	1,703	127	953		
23 Panama	15	1,676	2,264	4,556	31,592	2,232	229	3,565	195	6,716	329	769	102	2.[illegible]
24 Salvador	8	3,982	1,608	1,297	1,381	849	31	804	46	907	75	631	21	[illegible]
25 Mexico	177	49,988	31,287	51,347	117,129	23,559	6,146	58,892	1,982	34,700	1,524	25,435	1,154	20.[illegible]
26 Newfoundland and Labrador	11	735	148	538	12,729	1,770	162	1,892	309	2,773	399	3,481	7	[illegible]
27 Bermuda	36	3,352	720	2,816	4,205	320	3	105	116	3,845			52	2.[illegible]
28 Jamaica	2	560	2,137	1,397	2,737	579	33	1,284	234	3,836	92	789	7	[illegible]
29 Trinidad and Tobago	10	6,052	2,217	1,444	7,294	489	311	3,668	14	703	105	250	10	[illegible]
30 Other British W. I.	4	260	613	613	4,564	710	276	2,824	84	257	106	264	29	[illegible]
31 Cuba	558	62,278	70,973	49,329	284,551	15,535	7,211	71,020	4,955	54,556	3,219	24,443	1,027	24.[illegible]
32 Dominican Republic	8	1,519	938	750	5,019	458	702	7,075	1,039	8,686	134	627	26	1.[illegible]
33 Haiti	2	5,042	282	598	5,900	385	59	825	204	2,350	92	1,295	1	[illegible]
34 Argentina	33	9,901	27,577	29,793	192,014	24,61[illegible]	1,623	10,770	1,640	12,614	296	1,197	1,034	24.[illegible]
35 Bolivia	17	17,550	359	8,541	1,636	389	24	480	36	1,819	44	3,732	17	[illegible]
36 Brazil	253	89,763	20,435	49,250	151,891	17,047	5,875	49,707	1,685	18,210	3,450	19,445	412	9.[illegible]
37 Chile	84	75,313	8,165	61,887	73,533	10,309	1,326	9,461	538	21,561	1,014	3,970	185	7.[illegible]
38 Colombia	80	9,436	1,683	22,364	12,721	1,350	506	5,205	1,781	5,704	580	2,552	179	4.[illegible]
39 Ecuador	4	92	529	157	4,812	171	99	1,252	56	439	99	446	41	1.[illegible]
40 Peru	17	5,931	2,200	5,611	14,276	2,701	6	252	214	5,879	56	1,105	111	3.[illegible]
41 Uruguay	1	923	14,102	4,676	13,118	1,838	2	327	229	1,013	100	211	108	2.[illegible]
42 Venezuela	16	2,626	598	1,051	27,593	1,449	44	835	335	3,838	562	1,900	59	2.[illegible]
43 British India	322	94,788	5,319	31,867	10,370	3,900	688	5,714	475	12,730	819	16,361	173	3.[illegible]
44 Straits Settlements			560	774	534	30	6	100	100	1,250	17	256	193	2.[illegible]
45 China	69	36,024	5,585	42,445	31,686	5,138	7,779	48,260	889	14,286	2,200	15,235	251	5.[illegible]
46 Java and Madura	2	1,651	91	1,515	1,967	707	5	195	211	1,542	523	2,061	39	1.[illegible]
47 Other Dutch East Indies	26	21,434	1	45	2,054	583			10	1,139	219	2,280	3	[illegible]
48 Hongkong	4	3,351	368	859	41	376	10	229	231	2,439	200	335	23	[illegible]
49 Japan	961	768,360	39,406	343,077	9,643	3,254	6,113	55,879	8,642	316,043	7,290	229,235	4,300	97.[illegible]
50 Philippine Islands	18	14,957	9,046	14,424	37,469	5,826	2,746	27,534	748	9,477	905	3,518	59	2.[illegible]
51 Australia	310	231,813	156,152	229,145	95,342	28,183	668	11,814	6,955	76,855	8,160	25,088	3,358	83.[illegible]
52 New Zealand	53	18,064	26,502	51,401	23,698	24,858	673	8,722	1,319	17,757	18,196	47,292	1,444	28.[illegible]
53 British South Africa	74	10,371	13,208	32,276	19,970	5,745	143	4,857	637	15,725	5,603	18,894	171	4.[illegible]
54 Egypt			1,512	1,359	430	461	8	1,840			100	537	1	[illegible]
Total value in dollars for ALL COUNTRIES		$1,668,000		$1,796,174		$311,467		$519,314		$1,027,600		$615,579		$1,717.6[illegible]

*Sections I and II appeared in the issue for May 31, 1924, pages 1158, 1159, 1160 and 1161. Section IV appears on pages 1210 and 1211

New England Trade Continues Spotty, Though in Fair Volume

THE demand for electrical material in New England represents a fair volume of business for this season, but orders from day to day fluctuate widely in value. It is estimated that New England jobbers are booking, on the average, about three-quarters as much business as a year ago. Central-station companies are buying line material in good volume, and the building industry is consuming fair quantities of wiring devices and rubber-covered wire. Hollow ware has begun to move more freely for gift purposes, and vacuum-cleaner sales in New England are running ahead of last year, according to a leading distributor. Popular interest in electric ranges and in smaller cooking devices is encouraging. Fan sales are very dull owing to a backward season.

Prices are reasonably steady except in wire and flexible armored conductor. Quotations on conduit boxes have weakened of late, but pipe is firm. Collections are holding up well in proportion to the reduced volume of trade. With the prospect of early adjournment of Congress and the recorded passage of national tax legislation, manufacturers and jobbers consider the outlook as somewhat improved.

Business Decreases in Southeast District—Weather Unfavorable

A GENERAL decrease in the volume of business in the Southeast district is reported by all electrical jobbers, though the impression is that the underlying conditions are sufficiently sound to warrant a reasonably optimistic outlook. Unusually cold and rainy weather throughout the entire section has caused considerable concern as to the future of the cotton crop, and this is having a depressing effect upon business in the small towns. Unless dry and much warmer weather is experienced in the next ten days a considerable slackening up in retail trade in small centers will probably ensue. These conditions have resulted in collections falling off slightly, though they are by no means bad. The principal delinquents are small contractors and municipalities, but the dealers, central-station companies and industrial firms are paying promptly.

The electric range business throughout the section is not only holding its own but is showing promise of further gains, while some orders are being

(Bureau of Foreign and Domestic Commerce)

Motors, Storage Batteries, etc., from the United States During 1923—Section III*

Stationary Motors Up to 200 Hp.		Stationary Motors Over 200 Hp.		Railway Motors		Primary Batteries		Storage Batteries		Power Transformers Over 500 Kva.		Other Transformers		Rectifiers, Motor Generators and Converters			
Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	
12,1	62	11,126	6	10,826			5,852	34,061	5,196	57,872			91	1,561	285	3,623	Belgium	1
47,2	3	280			1	354	16,521	10,011	9,363	117,684	2	79	3	615	2	438	Denmark	2
	18	13,950					4,838	970	42	709					3	1,089	Finland	3
22,1	75	18,604	31	120,490	6	26,034	427	126	6,696	58,858	42	516,390	836	16,208	12,063	317,804	France	4
40,6	13	2,468					24	25	320	8,420			20	2,600	3	3,408	Germany	5
26,3	2	780	1	2,000			63	68	323	2,612	4	169	132	10,522	438	1,999	Italy	6
14,5	52	4,645					29,732	7,530	2,094	45,608	10	3,372	34	109	13	15,320	Netherlands	7
9,1	19	4,812					68,037	15,021	1,450	23,796	3	58,275			89	3,507	Norway	8
63,3	98	105,349	120	187,091	4	4,498	74,412	13,162	7,940	98,721	133	116,112	57	7,365	221	29,615	Spain	9
4,6	34	5,805					46,180	12,640	1,350	22,584	2	394	38	2,969	92	1,698	Sweden	10
7,5	16	748							126	1,975					1	275	Switzerland	11
359,0	50	117,783	24	27,099	8	11,760	84,497	23,426	12,553	199,301	32	3,450	1,836	6,114	12,269	40,699	England	12
268,1	18	13,491			2	466	300	1,050	45	525			3	325	1	135	Scotland	13
19,7	1	255							356	2,727							Ireland	14
1,9	85	15,268					3,183	1,080	1,536	5,351	6	1,190	150	1,648	230	2,390	Canada: Maritime Provinces	15
444,2	09	401,331	27	27,332	22	12,079	45,512	13,362	11,783	176,559	203	39,223	19,692	50,545	17,643	94,407	Quebec and Ontario	16
8,0	03	114,375	1	1,036			3,580	1,673	1,793	23,753	56	609	1,786	5,599	3,999	15,724	Prairie Provinces	17
5,8	13	30,726			1	203	9,530	2,676	1,260	14,158	19	4,154	380	3,235	359	4,424	British Columbia and Yukon	18
3	10	2,501					24,209	4,315	147	3,451	41	4,198	151	6,851	26	2,134	Costa Rica	19
9	45	13,636					49,272	7,810	219	4,548	453	46,653	68	3,316	8	1,439	Guatemala	20
9	40	6,506	1	2,700	1	709	45,266	12,051	145	2,298	52	7,122	31	3,651	17	5,072	Honduras	21
	7	1,219					25,513	6,923	243	5,649	39	4,358	17	164	4	73	Nicaragua	22
2,2	35	6,784	1	153			47,628	10,480	863	21,915	24	9,426	143	535	21	1,731	Panama	23
	96	6,078					7,140	2,209	489	7,869	34	2,330	112	6,554	33	2,258	Salvador	24
20,0	09	154,537	17	33,373	21	17,087	907,219	158,431	4,261	111,483	553	104,117	1,703	66,950	1,154	30,143	Mexico	25
2	26	8,302					130,231	32,500	287	4,678	33	3,665	93	3,496	4	425	Newfoundland and Labrador	26
2,0	24	2,420					28,214	4,660	60	842	36	3,041	140	2,201	5	1,179	Bermuda	27
1	08	3,380					42,280	7,865	553	8,624	12	1,107	50	6,295	7	515	Jamaica	28
5	3	1,012					21,219	4,645	341	5,203			77	3,297	44	735	Trinidad and Tobago	29
	21	1,248					19,831	5,338	198	3,083	3	145	48	1,202	4	168	Other British W. I.	30
24,1	96	121,256	4	6,418	8	4,486	440,469	92,053	5,802	105,449	470	54,104	3,587	71,371	1,084	21,495	Cuba	31
1,0	42	4,592					44,309	9,656	238	2,530	18	1,056	118	8,099	9	2,480	Dominican Republic	32
	16	2,116					11,164	2,102	171	3,041	21	4,340	17	790			Haiti	33
24,8	18	157,393	9	21,975			1,097,533	309,829	25,404	255,241	54	4,559	887	4,659	1,166	18,382	Argentina	34
5	07	11,242					954	365	31	503	19	26,634	42	2,331			Bolivia	35
9,9	05	65,427	3	4,049	104	65,522	112,277	26,951	6,951	92,401	479	188,223	1,785	28,005	338	41,791	Brazil	36
7,0	06	45,850	53	73,976	35	136,488	116,598	21,968	1,260	34,458	305	112,490	740	37,572	171	11,359	Chile	37
4,9	28	46,696			71	37,824	116,150	22,738	395	7,964	120	10,394	957	27,425	27	2,758	Colombia	38
1,0	29	3,274					8,973	1,924	194	3,518	30	2,446	53	2,249	6	691	Ecuador	39
3,5	17	33,763	13	8,168			32,958	8,126	1,113	17,051	100	39,751	269	11,260	45	5,398	Peru	40
2,5	32	2,277					103,104	25,646	2,569	26,897			496	1,423	165	5,304	Uruguay	41
2,2	46	13,783					129,474	22,097	273	4,628	88	12,130	67	4,974	48	1,253	Venezuela	42
5,9	96	203,982	33	137,338			309,070	42,025	5,607	57,001	43	61,922	348	35,085	234	45,500	British India	43
2,7	28						30,062	4,345	1,174	20,161	4	1,501	18	1,184	4	63	Straits Settlements	44
5,6	98	88,741	16	17,368			113,275	28,815	1,974	37,994	183	112,219	6,802	115,335	1,016	5,969	China	45
1,0	31	938					8,214	4,593	1,887	29,949			8	707	256	72	Java and Madura	46
1	61	3,745					558	124	54	2,812	9	5,992	17	2,464	11	27,926	Other Dutch East Indies	47
6	68	7,628					168,638	31,249	177	3,409	67	10,139	536	2,647	6	2,956	Hongkong	48
97,8	88	454,844	17	45,993	312	252,788	16,568	6,009	1,257	27,817	3,370	1,490,345	918	62,211	653	170,801	Japan	49
2,3	97	25,730	1	203			421,106	45,495	1,999	39,490	159	26,668	64	2,624	40	1,741	Philippine Islands	50
81,9	54	370,425	81	52,497	131	79,446	322,764	71,256	15,958	235,466	169	41,766	4,001	53,578	1,024	32,600	Australia	51
28,3	31	115,100	25	25,316			353,881	87,043	6,028	98,766	82	50,054	1,106	29,073	530	8,679	New Zealand	52
4,3	98	156,516	16	43,466			73,338	16,389	8,049	161,021	21	4,679	1,265	28,063	295	3,108	British South Africa	53
		11,559	10	6,740			3,226	825	101	1,850	1	175	1	200	61	1,005	Egypt	54
$1,717,8		$3,041,879		$859,618		$663,719		$1,272,619		$2,344,232		$3,195,315		$762,408		$999,516	Total value in dollars for ALL COUNTRIES	

placed by the larger dealers for stocks of fall heating equipment. Orders for poles, pole-line hardware and cross-arms are reported satisfactory, and lightning-arrester sales are almost up to normal. The inclement weather has also resulted in a slowing down in the movement of fans, and some of the small dealers are a little uneasy as to their ability to dispose of their stock, but warmer weather should clear up this situation.

Inquiries Increasing in New York District—Sales Spotty

BUSINESS in the New York district is considered as having passed the low point, although there has as yet been no marked increase. More inquiries are being received and somewhat more life is in evidence in the market. Sales in general are spotty, but the total volume is being maintained at a satisfactory level. It is believed that those manufacturers that practice aggressive selling for the next three months will be in a position to obtain a good fall business, and this is confidently expected. There has been undoubtedly a noticeable increased interest in the market.

During the week a large order for cross-arms was placed by a railroad undergoing electrification. Several orders for substation equipment were also received by manufacturers. Many outdoor substation propositions are being quoted on, and utilities are making inquiries for poles in good number. Collections in the majority of cases are reported as being good.

Trade in Middle West Feels that Business Is Improving

BUSINESS revived somewhat in the Middle Western district this week, central-station construction is progressing rapidly, and several large construction contracts have been placed. Leaders in business and finance agree in predicting that a turn for the better is impending. Apparently their opinions were borne out by the other news of the week. It should be noted that the general business even now is fair and not bad, since commodities continue to move in consumers' hands in generous quantities. While admitting a sharp falling off in business in the last few months, it is believed that the industry has touched bottom and that the reaction cannot continue much

(Original Data Supplied by the Bure

Principal Exports of Locomotives, Starting and Control Equipment, Fans, Lamp

	Railway Locomotives		Mining and Industrial Locomotives		Other Motors		Starting and Controlling Equipment		Accessories and Parts for Motors		Electric Fans		Incandescent Lamps Carbon-Filamen	
	No.	Dollars	No.	Dollars	No.	Dollars	Pounds	Dollars	Pounds	Dollars	No.	Dollars	No.	Dolla
1 Belgium					1	365	14,142	6,161	37,499	16,110	353	1,771	1,000	
2 France	1	223,775			1	50	55,943	46,136	176,961	95,950	915	5,244		
3 Germany					3	1,863			20	137				
4 Greece							74	22	12,908	4,632			1,500	
5 Italy							18,962	14,308	14,411	7,214	51	355	1,000	
6 Netherlands					7	186	20,471	13,541	4,304	3,276	165	1,454		
7 Norway							338	352	7,265	5,436	10	111	932	
8 Portugal							8,298	8,775	30	37				
9 Spain	6	484,403	3	5,625	3	440	219,986	67,538	81,187	28,518	1,458	14,611	340	
10 Sweden					8	2,426	50	101	1,754	1,169			150	
11 Switzerland									352	875				
12 England	4	33,367	4	7,291	61	2,282	440,494	294,209	139,243	70,537	4,848	35,512	9,944	
13 Scotland							358	320	60,403	80,826	6,709	51,087		
Canada:														
14 Maritime Provinces					4	66	8,364	5,874	17,589	9,300	17	233	322	
15 Quebec and Ontario	2	41,850	1	4,047	291	34,774	967,214	537,285	802,959	289,327	4,732	48,910	152,621	
16 Prairie Provinces					65	7,024	26,695	14,772	27,303	16,127	523	5,112	2,237	
17 British Columbia and Yukon			1	3,025	10	1,503	33,840	14,841	23,565	13,619	466	6,654	719	
18 British Honduras							8	19	2,321	1,932	5	138	800	
19 Costa Rica					2	272	631	541	11,848	5,809	19	199	1,540	
20 Guatemala					2	202	93	34	2,631	1,355	11	157	1,100	
21 Honduras					18	4,050	2,488	754	9,199	4,582	79	1,971	7,810	
22 Nicaragua					27	8,052	214	192	1,035	732	8	223	2,252	
23 Panama					20	2,217	713	807	8,930	9,000	177	1,965	6,306	
24 Salvador							470	220	458	548	42	1,005	1,097	
25 Mexico	1	3,532	16	47,296	178	28,267	73,916	34,381	207,827	112,513	2,466	46,915	32,551	
26 Newfoundland and Labrador							1,757	933	8,389	6,052	3	27	1,443	
27 Bermuda					26	1,681	249	104	1,848	1,319	30	623	6,920	
28 Jamaica					1	85	175	374	8,573	3,330	73	1,612	8,766	
29 Trinidad and Tobago					3	185	854	436	14,192	6,571	7	123	3,535	
30 Other British W. I.					5	279	32	18	1,129	626	101	2,128	1,214	
31 Cuba					22	3,769	60,557	33,490	200,443	123,726	1,227	21,437	13,137	
32 Dominican Republic					42	368	1,422	600	12,149	6,467	36	597	9,152	
33 Argentina					125	16,155	24,031	10,491	28,996	15,475	3,274	66,275	24,665	
34 Brasil					9	1,500	36,849	17,654	190,787	67,033	486	7,319	3,303	
35 Chile	39	2,091,861	3	34,359			39,550	29,811	319,164	141,240	191	4,411	6,282	
36 Colombia					5	620	5,419	3,485	23,663	17,206	703	11,745	17,847	
37 Ecuador							55	122	2,425	2,039	90	1,194	8,500	
38 Peru					1	60	22,324	8,242	94,997	49,287	19	390	3,211	
39 Uruguay					5	407	579	257	2,428	2,393	35	1,077	861	
40 Venezuela					2	445	1,896	845	27,589	14,288	310	4,046	9,328	
41 British India			1	2,570	7	1,531	329,921	107,885	341,395	114,485	6,419	135,820	7,974	
42 Straits Settlements							502	625	2,422	1,587	175	2,493	2,700	
43 China					66	4,284	58,516	19,258	9,273	5,235	8,328	169,337	110	
44 Chosen	2	32,908					9,557	1,585	300	229				
45 Hongkong					1	58	467	243	1,061	800	3,180	50,627	400	
46 Japan	26	118,346	33	146,759	176	85,948	531,211	207,257	271,840	106,617	2,140	38,632	105	
47 Kwangtung, leased terr.							3,202	1,263	3,439	4,101	36	890		
48 Philippine Islands					12	947	3,603	2,187	22,166	12,697	433	7,360	4,100	
49 Siam							993	316	18,613	5,096	932	16,674		
50 Australia	2	7,098			39	4,849	301,659	199,878	252,122	80,611	3,318	60,148	27,788	
51 New Zealand					6	1,659	41,269	14,001	59,079	20,913	390	6,650	6,318	
52 British South Africa			7	13,766	4	249	22,989	11,340	97,502	40,299	482	7,114	804	
53 British East Africa					5	9,000		436		306				
54 Egypt					3	936	29,841	9,101	17,955	6,946	130	1,884		
Total value in dollars for ALL COUNTRIES		$3,037,140		$269,738		$230,625		$1,751,707		$1,658,967		$861,325		

*Sections I and II appeared in the issue for May 31, 1924, pages 1158, 1159, 1160 and 1161. Section III appears on pages 1208 and 1209.

longer, as merchants' stocks must be replenished. Contrasting with this optimistic outlook are the impending labor troubles in the building trades. A tie-up of building activities is likely to occur, which is regrettable at this time of intensive building programs.

Manufacturers of incandescent lamps reported receiving orders for lamp requirements from various utilities for the third quarter, totaling over half a million dollars. The demand for high-tension equipment has been especially good this week as compared with the previous week. Pole-line hardware was also actively purchased. However, the call for wire, with the exception of magnet wire, was sluggish. Prices of rubber-covered wire and lamp cord declined approximately 5 per cent last week

Business Slow on Pacific Coast—Good in San Francisco

ALTHOUGH there has been much prevalent talk about decreased business and the necessity for retrenchment on the Pacific Coast, business is actually considered to be holding up well in the San Francisco district. The conditions in southern California and elsewhere are thought perceptibly slower.

The present situation is considered as a natural reaction after the tremendous spurt of the last few years with its inevitable inflation and speculation.

Dealers report business as better than usual and expect that the seasonal slowing down will be more than offset by new radio business, which was never better than now and bears every evidence of healthy expansion. Rubber-covered and lead-covered wires have decreased in price about 10 per cent and weatherproof wire has dropped ½ cent per pound. The market is flooded with cheap rubber-covered wire, but there are few buyers. The mining activity predicted early in the year for northern California is beginning to materialize in several sizable orders for telephones, pole-line hardware and other preliminary equipment. A transmission tie line between the California and Oregon power companies is now under contemplation. Despite 15 per cent to 20 per cent increases on porcelain goods, an excellent business is reported. The recent hot spell has given considerable impetus to the fan season, although the net sales to date are below those of last year.

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of Foreign and Domestic Commerce)

Flashlights, Searchlights etc., from the United States During 1923—Section IV*

Incandescent Lamps Metal-Filament		Other Electric Lamps		Flashlights		Searchlights and Projectors		Motor-Driven Household Devices		Domestic Heating and Cooking Devices		Industrial Electric Furnaces and Ovens		Therapeutic Apparatus X-Ray Machines, etc.			
No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	Lbs.	Dollars		
3,541	1,707	707	1,577	.....	.....	12	4,260	2,616	75,792	777	14,051	3	1,786	23	3,790	Belgium	1
2,572	688	426	1,446	150	143	.....	.....	4	512	24	112	.....	.....	39	359	France	2
120	65	580	1,055	.....	.....	187	3,645	1,379	46,408	1,045	5,692	5	767	708	18,720	Germany	3
192	126	4	40	.....	.....	.....	.....	10	726	17	574	.....	.....	.....	.....	Greece	4
9,239	3,529	13	126	2,957	2,654	241	9,466	963	19,227	460	1,835	4	558	28	8,375	Italy	5
1,279	534	2,093	8,212	780	1,024	5,512	21,104	2,912	79,448	1,656	7,358	8	763	24	6,084	Netherlands	6
282	280	25	51	2,017	1,214	150	320	166	8,195	4,335	5,830	32	1,063	64	10,007	Norway	7
100	32	.....	.....	187	137	.....	.....	1	49	.....	.....	.....	.....	3	1,665	Portugal	8
26,774	6,825	1,591	1,572	4,424	2,995	139	2,837	124	4,459	1,628	8,790	12	11,965	215	18,483	Spain	9
1,398	943	667	2,792	838	763	44	960	113	5,598	65	1,021	4	4,792	65	13,487	Sweden	10
100	20	1	75	.....	.....	24	106	1,377	36,396	136	1,087	1	201	317	24,232	Switzerland	11
32,331	14,884	6,728	25,289	6,878	2,248	107	1,631	10,758	259,255	51,938	115,289	152	15,636	1,733	71,178	England	12
1,472	811	78	549	.....	.....	65	15,153	82	3,188	2,024	13,156	.....	.....	5	1,254	Scotland	13
1,341	610	634	1,705	376	505	115	2,180	41	1,342	1,997	5,932	16	1,266	51	16,650	Canada: Maritime Provinces	14
139,941	31,654	19,768	60,573	61,760	29,359	1,866	34,954	3,923	108,336	51,036	189,247	544	31,871	927	86,671	Quebec and Ontario	15
3,958	1,045	1,221	4,406	4,056	3,466	604	7,578	1,016	26,580	8,030	22,679	164	8,907	362	25,954	Prairie Provinces	16
21,033	3,868	3,790	3,322	537	464	377	6,672	366	8,137	5,245	12,056	17	5,786	226	12,399	British Columbia and Yukon	17
6,454	1,895	60	18	2,657	1,867	.....	.....	1	37	18	70	.....	.....	4	2,668	British Honduras	18
14,480	4,005	257	698	3,303	2,031	25	851	3	171	146	2,425	12	495	8	8,242	Costa Rica	19
50,352	10,713	891	537	4,782	3,866	19	1,164	26	710	493	1,765	3	1,120	13	4,158	Guatemala	20
35,606	11,417	374	3,713	5,634	4,172	213	1,964	8	267	540	4,360	10	342	1	35	Honduras	21
20,633	4,729	175	182	1,887	2,321	2	14	4	142	52	211	.....	.....	.....	.....	Nicaragua	22
60,968	13,790	1,100	1,867	4,806	2,648	52	392	77	1,366	3,985	16,919	33	3,907	4	10,560	Panama	23
84,474	14,301	955	1,112	1,876	1,134	14	269	5	104	230	620	1	175	6	2,086	Salvador	24
1,087,845	255,194	13,018	17,330	93,664	55,462	2,375	6,384	422	5,870	9,978	45,716	83	14,634	255	18,830	Mexico	25
88,251	18,902	34	469	2,631	1,231	10	495	11	542	459	2,545	1	163	3	368	Newfoundland and Labrador	26
3,757	1,073	599	3,048	1,804	1,981	.....	.....	34	1,139	296	4,965	1	141	2	116	Bermuda	27
21,650	5,225	4,938	2,353	2,361	1,267	11	625	1	54	70	1,578	3	1,083	38	177	Jamaica	28
49,707	8,202	173	286	3,507	2,077	14	183	.....	.....	173	491	.....	.....	1	113	Trinidad and Tobago	29
26,237	6,532	2,434	1,369	3,317	1,774	12	264	13	278	183	1,412	8	460	2	72	Other British W. I.	30
915,269	185,018	4,656	10,167	32,281	17,890	130	4,894	638	6,792	7,940	29,026	153	12,379	222	21,249	Cuba	31
31,094	10,429	2,000	2,201	2,999	2,757	14	607	3	78	123	374	1	89	1	21	Dominican Republic	32
490,001	94,706	1,295	6,836	130,072	111,698	416	5,054	549	8,454	12,470	43,853	19	19,616	424	104,193	Argentina	33
45,898	21,985	524	2,386	9,802	7,131	434	19,938	331	2,930	2,439	9,845	81	1,462	107	24,585	Brazil	34
309,269	56,579	16,343	11,480	6,274	3,312	447	58,128	80	1,514	1,587	7,090	25	2,384	62	15,008	Chile	35
169,848	34,413	424	2,047	14,680	11,023	12	4,930	24	624	904	8,488	2	79	70	18,217	Colombia	36
14,096	3,501	534	776	384	451	.....	.....	28	334	419	904	1	70	2	149	Ecuador	37
78,037	20,394	291	1,061	3,486	1,863	16	606	95	1,514	742	3,062	4	717	20	8,249	Peru	38
133,727	19,340	284	1,290	3,170	2,154	20	65	16	569	2,118	6,932	2	272	259	7,313	Uruguay	39
66,620	12,929	1,956	1,071	19,898	12,825	2	35	70	311	448	1,619	2	87	68	3,485	Venezuela	40
35,547	9,730	122	371	48,591	61,918	150	17,132	33	835	920	4,381	27	25,699	98	3,719	British India	41
57,615	6,877	1,208	2,020	5,165	4,573	30	511	.....	.....	137	285	.....	.....	6	72	Straits Settlements	42
59,071	14,023	1,225	4,967	5,783	4,172	63	2,337	365	4,677	6,649	28,557	20	4,915	507	20,040	China	43
660	748	112	205	.....	.....	.....	.....	.....	.....	1	25	.....	.....	2	140	Chosen	44
13,417	2,742	52	392	29,615	22,999	77	2,031	31	759	848	4,039	2	107	91	1,327	Hongkong	45
67,397	17,623	939	12,875	435	346	339	99,388	275	16,028	10,315	59,359	166	17,896	454	74,004	Japan	46
38	52	6	50	.....	.....	26	3,443	6	224	.....	.....	1	112	6	1,326	Kwangtung, leased terr.	47
32,127	8,309	1,914	3,244	46,091	52,014	27	828	144	2,083	651	3,792	6	1,605	54	12,168	Philippine Islands	48
1,030	430	.....	.....	72	14	8	1,950	.....	.....	342	706	1	363	.....	.....	Siam	49
527,037	100,565	4,184	12,675	22,901	15,056	132	4,347	3,914	101,478	64,845	198,709	104	9,311	638	101,169	Australia	50
82,400	14,429	1,805	4,821	28,011	16,979	69	6,624	458	12,168	11,470	50,461	32	243	647	42,399	New Zealand	51
234,785	48,738	1,494	1,972	11,889	7,409	209	6,988	192	1,838	8,759	29,596	170	1,891	71	21,807	British South Africa	52
7,418	1,877	2	4	.....	.....	.....	.....	.....	.....	13	27	.....	.....	.....	.....	British East Africa	53
44	46	116	161	.....	.....	.....	.....	.....	.....	14	178	1	175	2	250	Egypt	54
.....	$1,131,075	.....	$234,534	.....	$494,227	.....	$366,298	.....	$866,212	.....	$984,348	.....	$215,960	.....	$869,305	Total value in dollars for ALL COUNTRIES	

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Austin Company Removes Chicago Headquarters

The Austin Company, Cleveland, engineer and builder, announces the removal of its Chicago headquarters from the Continental and Commercial National Bank Building to Suite 1300 Burnham Building, where greatly increased facilities will make it possible to render a complete building service to a larger number of clients. Of the several million square feet of floor space that Austin has under way today a large portion is in the Chicago territory.

General Electric Receives Order for Two Turbo-Generators

The General Electric Company has just received an order from the Philadelphia Electric Company for two 50,000-kw. turbo-generators, to be used at the new Port Richmond power plant. These machines will operate at 375 lb. gage, 233 deg. F. superheat, 1 in. absolute back pressure. The generators are rated at 13,800 volts, operate at 1,800 r.p.m. and are fitted with direct-connected 250-kw., 1,800 r.p.m, 250-volt shunt-wound exciters. The new power station in which these turbines will be installed will have an ultimate capacity of 600,000 kw.

Westinghouse Receives Order from Sheet Glass Company

The Westinghouse Electric & Manufacturing Company has received an order from the Libby Owens Sheet Glass Company, Toledo, Ohio, for three 1,500-kw. motor-generator sets; three 1,667-kva. oil-insulated, water-cooled transformers, 22,000 volts to 6,600 volts, and three 150 kva. type SK transformers, 6,600 volts to 440 volts. This equipment, with an eleven-panel switchboard and complete outdoor switching equipment, also ordered from the Westinghouse company, will be used in a new grinding and polishing plant being built by the Libby Owens Company at East Toledo, Ohio.

Palmer Electric & Manufacturing Plant Operating Day and Night

With orders on the books sufficient to keep the factory busy for six months, the Palmer Electric & Manufacturing Company, Cambridge, Mass., is operating a portion of its establishment night and day and has recently added 10,000 sq.ft., or about 50 per cent of its former floor space, to its production facilities. G. E. Palmer, president, states that orders are widely distributed throughout the country. The present volume of sales in dollars is about two and one-half times that of a year ago. Recently the company appointed the Electric Service Company, 47 North Hutchinson Street, Philadelphia, as district agent for Pennsylvania, Maryland, New Jersey and Delaware.

Electruck Corporation to Manufacture Electric Trucks

The Electruck Corporation, 536 West Forty-sixth Street, New York, has begun the manufacture of a new type of electric truck under the name of "Electruck." Ralph D. Ward, formerly of the Ward Baking Company, is president. In the last four years, while with the Ward Baking Company, Mr. Ward built more than three hundred electric trucks for use in that company's service. The Electruck Corporation is an outgrowth of this particular work, and the officers of the baking company have sold their former interests to engage in the manufacture of the "Electruck."

"Electrucks" will be built in 1-ton and 3-ton sizes and be equipped with two motors of direct-chain drive. The vehicle is fitted with a new form of axle, battery cradle and cradle suspension, resulting in 7 in. more clearance below cradles, and there are no side projections so that a shorter turning radius is secured. Ball bearings are used throughout.

The other officers of the corporation are W. S. Ward and Benjamin H. Britt, vice-presidents, and Thomas A. Downey, secretary and treasurer. George S Ward, formerly president of the Ward Baking Company, is a director of the corporation.

The American Engineering Company, Philadelphia, has received an order from the Utica Gas & Electric Company, Utica, N. Y., for four fourteen-retort, thirty-three-tuyère stokers, with double-roll rotary ash discharge for boilers of 1,650 hp.

Curtis Lighting, Inc., Chicago, has moved its Los Angeles office from the Pacific Finance Building to 1040 Merchants' National Bank Building. The company has also opened a lighting studio at the new address.

The Economy Fuse & Manufacturing Company, Chicago, on June 1 removed its Chicago district sales office from 536 Transportation Building to larger quarters at 513 West Jackson Boulevard.

The Chicago Fuse Manufacturing Company, Laflin and Fifteenth Streets, Chicago, has placed on the market a shallow-ceiling box with clamps for loom. The box was designed to meet the new conditions of installation brought about by a rule of the 1923 National Electrical Code.

The Westinghouse Electric & Manufacturing Company is contemplating the erection of a warehouse and repair plant in Denver, at a cost of about $500,000.

The Novo Manufacturing Company has recently been organized in Los Angeles by E. F. Ford, formerly owner of the Ford Electric Fixture Company of that city. The company has moved into its newly constructed factory at 115 West Sixteenth Street and will specialize in the manufacturing of wrought-iron fixtures and lanterns.

Harvey Hubbell, Inc., Bridgeport, Conn., has recently placed on the market a new toggle switch. The company has also announced a line of 10-amp. and 20-amp. polarized shallow-flush receptacles, 1$\frac{3}{8}$ in. deep, which have been redesigned to fit standard convenience-outlet face plates.

The American Airdry Corporation, manufacturer of "Airdry—the electric towel," has recently moved its head offices and factory from Groton, N. Y., to Chicago, to secure a more centrally located distributing point.

The California Street Lighting Sales Company, Los Angeles, has been appointed exclusive distributor for the Union Metal Manufacturing Company's line of street lamp posts, exterior building fixtures, etc., in Los Angeles and southern California.

The Westinghouse Electric & Manufacturing Company is expected soon to receive an order for twelve electric locomotives, which are to cost $1,589,700, from the New York, New Haven & Hartford Railroad. The authority to issue equipment notes in the sum of $1,043,000 has been granted by the Interstate Commerce Commission, the funds to be applied on the purchase of these locomotives.

The Carr & Beck Electric Company has opened offices at Charleston, West Va., with J. D. Carr in charge, and will act as distributor of electrical equipment.

C. I. Brink, Inc., Boston, has recently received an order from the Gillette Safety Razor Company of Boston for a large electric sign that will contain approximately 2,500 lamps. The sign will be erected at the Gillette factory.

The Hart & Hegeman Manufacturing Company, Hartford, Conn., is now manufacturing a new adjustable keyless candle socket in two sizes which is said to meet virtually every combination of candle and candle holder.

The Pelton Water Wheel Company, San Francisco, has recently moved into its new factory and office building at Nineteenth and Alabama Streets in that city. The space which has been vacated in the main works at Nineteenth and Harrison Streets is now in process of remodeling, and when completed it is expected that production facilities will be practically doubled.

The Westinghouse Electric & Manufacturing Company announces the removal of its Des Moines (Iowa) office to 1211 Equitable Life Building, at Sixth and Locust Streets.

The Remy Electric Company, Anderson, Ind., manufacturer of automobile starting and lighting outfits, through its general manager, I. J. Reuter, after a careful check of its prospects for the next few months, issued the following statement to employees: "We will continue to operate as at present until June 20, when the factory will be closed

down for two weeks. Beginning operation on July 7, we are assured of four days' work a week, with the possibility of increasing to five days in August. There is no foundation for any rumors that the plant will close down for any other period excepting the two weeks as outlined."

The United Electric Company, Canton, Ohio, manufacturer of the Ohio electric cleaner, announces the appointment of C. T. Uhl as district sales manager for the Pittsburgh territory. Mr. Uhl was formerly division sales manager for the Apex Electrical Distributing Company in the Southwest.

The Wagner Electric Corporation, St. Louis, Mo., announces that its Pittsburgh representatives, Ludwig Hommel & Company, will after May 31 be at 929 Penn Avenue, Pittsburgh.

The Westinghouse Electric & Manufacturing Company is constructing a new heating plant at its East Springfield (Mass.) works for the purpose of supplying steam for heating and manufacturing processes. In addition to the building of the new heating plant, the present punch shop of the works will be doubled in size to accommodate the manufacture of electric fans and fan motors, which is being transferred from the Newark plant.

The Bethlehem Steel Company, Bethlehem, Pa., has received an order from the municipal authorities of Philadelphia for the installation of its Bethlehem-Dahl fuel-oil-burning equipment in the City Hall power plant.

The P. A. Geier Company, Cleveland, manufacturer of the "Royal" electric cleaner, is offering cash and merchandise to the value of $25,415 as prizes for a summer sales contest, which is to run from June 30 to September 13 and is limited to one thousand dealers' salesmen.

The Chidsey Company, 110 East Thirteenth Street, New York is now manufacturing a flashlamp that does not require the use of batteries, the electricity being generated by the pressure of the operator's fingers.

The Bakelite Corporation on May 12 last filed a bill of complaint in the United States District Court, Western District of New York, against the Durez Company, Inc., North Tonawanda, N. Y., for infringement of patents held by it.

The Ingersoll-Rand Company, New York, announces the election of L. D. Albin, formerly general sales manager, as vice-president in charge of European sales. D. C. Keefe, formerly assistant general sales manager, has been appointed to succeed Mr. Albin as general sales manager.

The Roller-Smith Company, 233 Broadway, New York, manufacturer of electrical instruments and circuit breakers, is now manufacturing a new double-range radio voltmeter, known as type PV, covering from 0-10 volts and 0-50 volts.

The Western Electric Company, San Francisco, has leased a one-story factory to be erected at Hubbard Street and Park Avenue, Emeryville, Cal., at a cost of about $40,000. It is planned to occupy the structure at an early date.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Static Condenser

A static condenser consisting of a number of condenser units, a reactance for damping out the higher harmonics in the voltage wave, a discharge resistance for draining the condenser charge when disconnected from the line, and an oil circuit breaker for the control of the equipment, has been developed by the General Electric Company. Each unit is composed of a large number of couples of metal foil with paper laminations as a dielectric. These units are mounted on a rack and in larger capacities the complete units are arranged in tiers or banks.

The losses in the 2,300-volt equipment are approximately one-half of 1 per cent kva. capacity. In the case of low-voltage equipments, where a transformer is included, the losses are approximately 3 per cent. The condensers are being marketed in six standard sizes from 30 kva. to 300 kva. for 40-cycle to 125-cycle circuits, 220 volts to 2,300 volts. The weights of the standard units, without reactor and transformer, range from 805 lb. in the 30-kva. size to 5,110 lb. in the 300-kva. size.

Magnetic Controllers

A new line of magnetic machine-tool controllers employing the counter-emf. method of acceleration has been placed on the market by the General Electric Company. These controllers are applicable to both reversing and non-reversing, constant and adjustable-speed drives requiring normal starting conditions. They have been developed primarily for application to direct-current motors in sizes ranging up to and including 15 hp.

The controller provides two accelerating points, the starting resistor being automatically short-circuited in one step upon proper acceleration of the motor. This is accomplished by an accelerating contactor whose closing is governed by the counter-emf. of the motor.

Electric "Tructor"

A new seat type of electric elevator "tructor," as it is called, handling the load by the cantilever method like a crane and with the operator stationed where he can observe the result of the control manipulation, has been developed by the Elwell-Parker Electric Company, Cleveland, Ohio. The elevator head may be equipped to handle steel plate, bales, boxes or barrels, car wheels or similar material.

The apparatus consists of a standard tractor type, hot-riveted tructor frame with battery compartment with hinged cover. The operator's seat actuates the electric circuit breaker connecting the battery to the controller. The circuit breaker closes only when the controller drum is in the off position and the controller comes to a full stop when reversing. The controller handle is removable. The wheelbase is short and permits the tructor to turn around in congested places. All four wheels are equipped with 7-in. double-row ball bearings and 20-in. x 3½-in. tires. The over-all length of the unit without load-lift attachment is 78 in., height 70 in., width 38 in., and weight complete with battery 4,300 lb.

Portable Electric Screwdrivers

A portable electric screwdriver and an automatic lag-screw driver which are both provided with an automatic overload safety device that shuts off the current when the motor runs beyond its rated capacity have been placed on the market by the John Steptoe Company, Cincinnati. The portable screwdriver weighs 5 lb., and it is said that by its use 3-in. No. 16 screws can be driven into hard yellow pine without first drilling a hole. The automatic lag-screw driver weighs 30 lb. and is for use in such instances as putting up countershafts or in lagging machines to platforms. These tools are part of the line formerly built by the Automatic Electrical Company, Cincinnati, the manufacturing and selling right of which line the Steptoe company has recently acquired.

Integrating Flow Meter

The new type of flow meter for measuring water or steam in pipes which was brought out by the Cochrane Corporation, Philadelphia, a little over a year ago has now had added to it an integrating device which imposes no load or resistance to the deflection of the U-tube, so that sensitivity and accuracy are undiminished.

The integrator is driven by a clock, the deflecting member of the meter merely controlling the position of a stop or motion-limiting pin. The integrator is similar in principle to the method used by steam engineers for obtaining the mean effective pressure of an engine indicator card, which consists in ruling evenly spaced parallel lines across the chart, adding up the lengths of the lines intercepted between the indicator lines and then dividing by the total number of lines which have been added. The indicator goes through motions equivalent to drawing a line from zero to the pen trace on the flow-meter chart once each minute, the length of this line being proportional to the momentary rate of flow and the sum of the lines proportional to the total flow for a definite period. The integrator can easily be calibrated and is said to give results within 1 per cent of absolute accuracy in a run during which the flow varies between 20 per cent and 100 per cent of full-load rating.

New Trade Literature

APPLIED ILLUMINATION.—The O. C. White Company, Worcester, Mass., is distributing two folders supplementing its last catalog. One, entitled "The Trend of Industrial Lighting," is devoted to shop fixtures and gives illustrations of its new-style "23D" and "24D" drafting-board fixtures. The other, entitled "The Factors of Lighting Efficiency," describes its new "2LA" conduit fixtures and "3SA" bench lamp.

CENTRIFUGAL BLOWERS AND COMPRESSORS. — Centrifugal blowers and compressors and their applications in water gas, coke ovens and in general industrial plants are discussed in a catalog, entitled "Centrifugal Compressors," issued by the De Laval Steam Turbine Company, Trenton, N. J. The apparatus described includes single-stage and multistage blowers and compressors for pressures up to 125 lb. per square inch. The illustrations show numerous machines as installed in water-gas plants, coal-gas plants and coke ovens, and also in use as boosters in city gas distribution.

LIQUID LEVEL GAGE.—The Foxboro Company, Foxboro, Mass., is distributing bulletin No. 82-2, covering its liquid level gages.

PRECISION INSTRUMENTS. — The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued No. 4,603, entitled, "Westinghouse Precision Instruments," which is devoted to the construction, operation and performance of precision voltmeters, ammeters and wattmeters manufactured by the company.

INSTRUMENT TRANSFORMERS. — "The Performance of Instrument Transformers" is the title of special publication No. 1,696, issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., for distribution to electrical engineers and to students of engineering who are interested in instrument transformers.

VERTICAL MOTORS.—The Ideal Electric & Manufacturing Company, Mansfield, Ohio, has issued circular No. 2,000, describing the "Ideal" vertical motors in both alternating-current and direct-current types.

TIME SWITCHES. — Bulletin No. 37 issued by the Albert & J. M. Anderson Manufacturing Company, 289 A Street, Boston, describes and illustrates the various types of the "Anderson" automatic time switches. It also gives an outline of various uses for time switches and directions for connecting and operating them.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase is desired in Raipur, India (No. 10,425), for electroplating machinery.

An agency is desired in Athens, Greece (No. 10,430), for electrical machinery, telephones and telephone appliances.

Purchase and agency is desired in Sofia, Bulgaria (No. 10,423), for motors and generators.

Purchase and agency is desired in Rustchuk, Bulgaria (No. 10,426), for electrically operated woodworking machinery for furniture, doors and windows.

INSULATORS FOR THE MORWELL (AUSTRALIA) POWER SCHEME.—Tenders will be received by R. Liddelow, secretary State Electricity Commission of Victoria, Melbourne, Australia, until August 4 for 66,000-volt insulators (specification 24/25) for the Morwell power scheme.

TURBO-GENERATOR, ETC., FOR MUNICIPAL PLANT AT TAIHAPE, NEW ZEALAND.—Tenders will be received by the Borough Council of Taihape, New Zealand, until August 1 for turbo-generator set, pressure governor and automatic weir for the Taihape hydro-electric plant.

ELECTRIFICATION OF A SPANISH RAILWAY PROPOSED. — The Spanish government, it is stated, has authorized the electrification of the railway between Vitoria and Estella.

ELECTRIFICATION OF RAILWAY LINES IN ITALY.—The Railway from Verona to Brenner Pass on the Austrian frontier, according to *Commerce Reports*, will be equipped for electrical operation in the near future. The line is 237 miles long and the electrical installation is in the hands of the Società Anonima Ernesto Breda of Milan. Financial backing for this electrification is said to have been received from American interests.

PROPOSED ELECTRIC WORK IN INDO-CHINESE.—New work planned by the Compagnie des Eaux et d'Electricité de l'Indochina, according to *Commerce Reports*, includes the installation of a new power plant at Pnompenh and the placing underground of the transmission cables between Cholon and Saigon. The work is to be completed in four years.

New Incorporations

THE OREGON-CALIFORNIA HYDRO-ELECTRIC COMPANY, Portland, Ore., has been incorporated by Samuel Cornell, Herman Kolberg and Sidney B. Vincent. The company is capitalized at $50,000 and proposes to construct and operate power plants.

THE NORTHWESTERN LIGHT & POWER COMPANY, Humboldt, Kan., has been organized to construct and operate utility plants. The officers are: D. M. Stearns, Humboldt, president and general manager; John A. Reed, Cedar Rapids, vice-president, and J. N. McCallum, Chicago, secretary and treasurer.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

SOUTH BERWICK, ME. — The Newickawnick Company is considering the construction of a power plant. S. T. Main, 200 Devonshire Street, Boston, is engineer.

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until June 10, for three sets of motor-driven mechanisms and three sets of spare parts for the local navy yard. (Schedule 2247.)

MERIDEN, CONN.—Plans are being prepared by the August Schmelzer Company, Meriden, Conn., for an elevated coal pocket, with elevating, conveying and other equipment. George P. Carver, Inc., 261 Franklin Street, Boston, is engineer.

Middle Atlantic States

BALDWINSVILLE, N. Y.—The Seneca River Power Company has applied to the Public Service Commission for permission to extend its transmission lines to the town of Clay.

BUFFALO, N. Y. — The Derbrah Silk Corporation, Military Road and Skillen Street, plans to build a power plant at its proposed local silk mill, to cost about $110,000.

BUFFALO, N. Y.—The Hendon Chemical Company, recently organized, care of the Combustion Utilities Company, engineer, 8 Bridge Street, New York, plans to build a power house at its proposed plant on the River Road, to cost about $500,000.

DEPEYSTER, N. Y.—The St. Lawrence County Utilities, Inc., Potsdam, has applied to the Public Service Commission for permission to extend its electric light service to Depeyster.

FALCONER, N. Y.—The Village Board of Trustees is considering extensions to the ornamental lighting system.

GOUVERNEUR, N. Y.—Application has been made to the Public Service Commission by the St. Lawrence Transmission Company, Potsdam, and the Oswegatchie Light & Power Company, Gouverneur, to construct electric plants here.

GOWANDA, N. Y.—The property of the Iroquois Utilities, Inc., which supplies electrical service in Gowanda, South Dayton, Randolph, Cherry Creek and other towns, has been purchased by Charles W. Young & Sons, Boston, at a foreclosure sale. The new owners, it is understood, will continue to operate the properties and will make improvements to same.

MOUNT VERNON, N. Y.—Contract, it is reported, will soon be awarded for extending the ornamental lighting system on Third Street from the Pelham line to the New York City line.

OLEAN, N. Y.—The Vacuum Oil Company contemplates the purchase of electric motors and pumping equipment for its new local pumping station.

OWEGO, N. Y.—The Owego Light & Power Company contemplates building another water-power plant of 700 kva. capacity and erecting a 33,000-volt, three-phase, 60-cycle transmission line to Richford, Berkshire and Newark Valley. R. E. Moses is superintendent.

POUGHKEEPSIE, N. Y. — The United Hudson Electric Corporation has issued $2,000,000 in bonds, the proceeds to be used for extension of the Sturgeon Pool hydro-electric plant, building transmission lines and the purchase of the property of the Honk Falls Power Company, Napanoch.

ROMULUS, N. Y.—The village officials are negotiating with the Empire Gas & Electric Company, Seneca Falls, to furnish electricity here. The company plans to erect a branch line from Seneca Falls through Fayette to Romulus.

ST. GEORGE, N. Y.—The Staten Island Rapid Transit Company, owned and operated by the Baltimore & Ohio Railroad Company, 2 Wall Street, New York, has authorized plans for a number of automatic substations for use in connection with the proposed electrification of its lines. Service will be furnished by the Staten Island Edison Company at 33,000 volts and stepped down and converted to 600 volts, direct current.

SCOTIA, N. Y.—A movement has been started to establish a new lighting district on Mohawk Avenue, Ballston Avenue and the Western Gateway approach. It is proposed to erect lamps similar to those on State Street, Schenectady.

SYRACUSE, N. Y.—The City Council is considering the installation of an ornamental lighting system on State Street.

WATERTOWN, N. Y.—Among the extensions contemplated by the Northern New York Utilities, Inc., are the erection of a 35-mile transmission line from its Black River plant, near Watertown, to Altmar, where it will connect with the lines of the Niagara, Lockport & Ontario Power Company, and the construction of a substation at Black River.

WELLSVILLE, N. Y.—Contract has been placed for a 500-kw. generating unit to be installed in the municipal electric plant this summer, for which $35,000 in bonds have been issued. F. M. Leonard is clerk.

ATLANTIC CITY, N. J.—The Atlantic City & Shore Railroad Company is planning to build a substation in Atlantic City, to cost about $75,000. A similar station will be built at Hammonton.

JERSEY CITY, N. J.—The Public Service Electric Corporation, Newark, N. J., has filed plans for an addition to its plant, foot of Duffield Avenue, to be equipped as a frequency-changing station, to cost $120,000.

FLEETWOOD, PA.—The question of establishing a municipal electric lighting system is under consideration by the Council.

HAZLETON, PA.—Work will soon begin on three transmission-line extensions by the Pennsylvania Power & Light Company to furnish electrical service in three towns. A line will be extended from the Black Creek Township to Mountain Grove; another line will be erected from Sybertsville to the I. P. Pardee county home and farms beyond that town; the Rock Glen lines will be extended into Lower Rock Glen to supply electric service in that section.

LOGANSPORT, PA. — The West Penn Power Company has been granted permission to construct a transmission line across the Allegheny River, near here.

MORRISVILLE, PA. — The Philadelphia Suburban Electric Company plans to install a local substation. Extensions will be made in transmission line.

PHILADELPHIA, PA.—Bids will be received by George H. Biles, Director Bureau of Water, until June 10, for one steam-turbine generator (Contract No. 685). Plans and specifications, room 796, City Hall.

PHILADELPHIA, PA. — Plans for the proposed extensions and betterments to the city water system, including development of new sources of supply, for which an appropriation of $13,500,000 is being arranged, provide for the installation of electric substation equipment, electric pumping machinery and other electric apparatus.

READING, PA.—The Berkshire Electric Company has arranged for an issue of

$60,000 in bonds, the proceeds to be used for extensions.

UNIONVILLE, PA.—The Wilmington & Philadelphia Traction Company plans to install and operate a system here. Service will be furnished from the Wilmington (Del.) power station, with transmission line by way of Kennett Square.

BERLIN, MD.—Steps have been taken by the Chamber of Commerce for extensions and improvement in the municipal electric light plant, to cost about $10,000.

HAGERSTOWN, MD. — Work has been started on the proposed new municipal electric light plant to be erected on Antietam Creek, near Grossnickle's Mill. Contracts, it is understood, will soon be awarded for equipment.

CLARKSBURG, W. VA.—Steps have been taken by the Chamber of Commerce to secure an extension of the standard lamps into the Glen Elk section.

EXCELSIOR, W. VA. — The Low Ash Mining Company contemplates rebuilding its power house at its local mining plant, recently destroyed by fire, with loss of about $16,000.

HARRISONBURG, VA.—Plans are under way to repair the municipal hydro-electric plant on the Shenandoah River, recently damaged, causing a loss of about $75,000.

NORFOLK, VA.—Preparations are being made by the Ford Motor Company, Highland Park, Mich., to begin work on its proposed local assembling and distributing plant, including a power plant, to cost about $1,250,000.

RICHMOND, VA. — The Wortendyke Manufacturing Company, manufacturer of paper products, plans to install electric power equipment at its proposed mill at Thirteenth and Byrd Streets, to cost about $200,000. Carneal & Johnson, Richmond, are architects.

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, until June 19, for street light globes, fuses, insulators, lead-sleeving, sockets, etc. (Circular 1613.)

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners until June 17 for repairs and replacements to the electrical operating machinery on the highway bridge across the Potomac River.

WASHINGTON, D. C.—Bids will be received by the Chief of Air Service until June 10 for fifty ignition-switch assemblies. (Circular CAS-110.)

WASHINGTON, D. C.—Bids will be received by the Board of District Commissioners until June 16 for cast-iron lamp posts and parts, in lots of one, twenty-five, fifty and one hundred, as per specifications on file.

North Central States

BAY CITY, MICH.—The Wildman Rubber Company has begun excavations for a power house, 48 ft. x 84 ft. The project will include a 125-ft. radial brick stack.

DETROIT, MICH.—The Detroit Edison Company has taken out a permit for a substation on Trombley Street, between Russell and Riopelle Streets, to cost about $130,000.

CINCINNATI, OHIO.—Plans are being considered by the City Council for replacing the gas lamps now in use on Clifton Avenue from Ludlow Avenue north with electric lamps.

CLEVELAND, OHIO.—Bids will be received by the Commissioner of Purchases and Supplies, room 226, City Hall, until June 13 for panel glass for "white way" lanterns for the division of light and power. Bids will also be received on the same date for condensers and condenser auxiliaries (for 15,000-kw. steam turbine) for division of light and power.

CLEVELAND, OHIO.—Bids will be received by the Commissioner of Purchases and Supplies, room 226, City Hall, until June 11 for storage batteries, covering all the city's requirements on lighting and starting storage batteries for a period of one year. Bids will also be received at the same time for fuses, covering all the city's requirements on cartridge, plug, plain and refillable fuses and wire for a period of one year.

COLUMBUS, OHIO. — The Columbus Railway, Power & Light Company has filed plans for an addition to its power plant on East Gay Street, to cost about $125,000.

DELAWARE, OHIO. — The Suburban Power Company of Delaware County has secured permission to acquire the property of the Suburban Light & Power Company, and also to issue $82,700 in capital stock and $83,000 in bonds, the proceeds to be used for extensions and improvements, to the system.

CENTRAL CITY, KY. — The Kentucky Utilities Company is planning to rebuild the local electric lighting system and is erecting a high-tension line from Central City to Mogg and will connect with the line at Livermore.

SMALLEY, KY.—The Martin Light & Power Company, recently incorporated, plans to install and operate an electric plant here.

TAYLORSVILLE, IND.—The Taylorsville Light & Power Company, recently organized, has contracted with the Interstate Public Service Company for power supply and will install a transmission line and distributing system in this district. B. L. Foster and F. R. Richards are interested in the company.

JOLIET, ILL.—Work has started on the construction of a power house in Joliet for the Elgin, Joliet & Eastern Railroad Company, to cost about $250,000.

ATHENS, WIS.—Bids will be received by A. A. Kreutzer, Village Clerk, until June 12 for two 300-gal.-per-minute centrifugal pumps with motor and engines and one 300-gal.-per-minute deep-well centrifugal vertical-shaft pump, in connection with waterworks extensions, etc. W. G. Kirchoffer, 22 North Carroll Street, Madison, engineer.

SUPERIOR, WIS.—Plans are under way by the Reeves Coal & Dock Company for the construction of a new coal dock, to cost about $750,000, which will be equipped with electrically operated machinery.

CHISHOLM, MINN.—The Balkan Township Committee has authorized the construction of a transmission line on McNiven Road for local light and power service. G. Gross is township engineer.

LE SUEUR, MINN.—Bids will be received by James A. Morgan, City Clerk, until June 18 for the installation of an ornamental lighting system. The plans include thirty-five lamp posts, suspension street lamps and bracket street lamps. Ralph W. Richardson, St. Paul, is engineer.

VIRGINIA, MINN.—The City Council has authorized certificates to the amount of $31,150 issued for extending and remodeling the municipal electric light and power plant.

HAWARDEN, IOWA.—Petitions are being circulated asking for a special election be held to vote on the proposal to issue bonds for the construction of a new municipal electric plant. The cost is estimated at about $50,000.

MENNO, S. D.—The Northwestern Public Service Company has acquired the local electric plant owned by Mettler Brothers. Plans are under way to change the system from direct current to alternating current.

SIOUX FALLS, S. D.—Bids will soon be asked for the erection of an addition to the municipal power plant, to cost about $35,000. New equipment will be installed.

WOLSEY, S. D. — The Northwestern Public Service Corporation has been granted a franchise to furnish electrical service here. The local plant, owned by the Holcomb Brothers Company, has been taken over by the company, which expects to establish a twenty-four-hour service soon.

OMAHA, NEB.—The Nebraska Power Company is reported to be considering the construction of a substation at M and Twenty-second Streets and extending its transmission system to this section.

Southern States

WINSTON-SALEM, N. C.—Plans for the proposed extensions and improvements to the municipal waterworks, to cost about $750,000, provide for electrically operated pumping equipment.

SPARTANBURG, S. C.—The Board of Water Commissioners contemplates the installation of a hydro-electric power station for municipal service in connection with a proposed development for water supply on on the Pacolet River. The entire project will cost about $1,350,000. Paul Norcross, Atlanta, Ga., is consulting engineer.

SUMMERVILLE, GA. — The Georgia Railway & Power Company is considering the purchase of the local distribution system and the erection of a 110,000-volt transformer station.

BRADENTOWN, FLA. — The Southern Utilities Company has acquired a site on the Monatic River, on which it proposes to build a new electric plant, to cost about $250,000.

MIAMI, FLA.—Arrangements are being made by the Miami Electric Light & Power Company for extensions to cost about $2,000,000. The present plans include the construction of an entire new plant, three substations and laying a large amount of cable. Orders, it is understood, have been placed for equipment. The plans provide for an ultimate expenditure of $6,000,000.

ST. PETERSBURG, FLA.—Bids will be received by the Director of Public Works until June 9 for the installation of an ornamental lighting system on a portion of Beach Drive.

DRESDEN, TENN.—The municipal electric lighting plant is reported to have been acquired by the Kentucky-Tennessee Power Company, Hopkinsville, Ky.

BESSEMER, ALA. — The Harbison-Walker Refractories Company, Farmers' Bank Building, Pittsburgh, Pa., plans to build a power house at its proposed firebrick and refractory plant in this section. The entire plant will cost about $300,000.

BIRMINGHAM, ALA. — The Alabama Power Company has applied to the Public Service Commission for permission to erect an 80-mile transmission line from Cherokee Bluffs to Electric, with distribution system in Electric; also a line from Roanoke to Five Points, with distribution system in latter place, and to erect a distribution line from the Carbon-Hill-Brilliant transmission line to Winfield and Guin. The company is also considering extending its high-tension transmission line from Union Springs to Midway, Clayton, Louisville and Clio.

FLORENCE, ALA. — Bids will be received at the United States Engineer's office, Florence, until June 14 for operating machinery for regulating gates at Wilson Dam, Tennessee River. Bids will also be received until June 18 for furnishing screens, headgates, roller trains, etc., for the power house at Wilson Dam.

TUPELO, MISS.—The Mississippi Light & Power Company plans to install a turbo-generator and auxiliary equipment at its local plant, recently acquired.

CYRIL, OKLA.—The Chickasha (Okla.) Gas & Electric Company plans to erect a transmission line to Cyril.

KERENS, TEX.—The Texas Power & Light Company has acquired the system of the Kerens Light & Power Company and will consolidate it with its system. Extensions will be made in substation facilities and transmission system.

Pacific and Mountain States

ANACORTES, WASH.—The City Council has granted the Puget Sound Power & Light Company a fifty-year franchise here. The company plans to take over the local system of the Washington Power, Light & Water Company. Extensive improvements are contemplated by the new owners.

OKANOGAN, WASH.—The Washington Irrigation & Development Company is reported to be planning to build a power dam on the Columbia River for a hydro-electric development.

SEATTLE, WASH. — A movement has been started by merchants in what is known as the "Triangle retail district," bounded by Westlake Avenue, Pine Street and Ninth Avenue, for the installation of a new lighting system in that district. Parts of Stewart, Howell and Olive Streets may be included.

SEATTLE, WASH.—J. D. Ross, Superintendent of the Department of Lighting, has submitted a report to the City Council asking for an appropriation of $445,000 from the city light fund to take care of new business, of which $300,000 will be used for extensions to supply new customers in the residence districts, $20,000 to extend the street-lighting system, $75,000 for new underground conduits and $50,000 to construct extensions to shops and stores in the business sections. He also recommends the sale of $1,000,000 in bonds, most of the proceeds to be used for improvements to the city distribution system to take care of the power from the Skagit project expected next month.

THE DALLES, ORE.—Application has been made to the Federal Power Commission by H. V. Gates, The Dalles, for a license to build a small power plant on Crooked River in Jefferson County.

BAKERSFIELD, CAL.—The City Council has authorized the installation of ornamental lamps on Baker Street and on Sumner Street, maintained by underground wires. Plans are being drawn for an ornamental lighting system on Chester Avenue from Twenty-sixth Street to the city limits. W. D. Clarke is city engineer.

EUREKA, CAL.—H. L. Jackman, Eureka, and associates have been granted permission by the State Department of Public Works to use water from the Klamath River in Humboldt County for a hydro-electric power development of 92,000 hp., to cost about $9,000,000, with transmission system.

LOMPOC, CAL.—The Municipal Electric Light and Power Department contemplates the installation of fifty ornamental lamp standards in the business district. E. A. Vaughan is manager.

OROVILLE, CAL.—Plans are under consideration for the construction of a new substation for the Sacramento Northern Railroad in Oroville.

REDONDO BEACH, CAL. — The City Trustees have authorized the installation of ornamental systems on about 6 miles of streets, to cost about $100,000. Bids will be asked within thirty days.

REDWOOD CITY, CAL.—The Pacific Gas & Electric Company plans to reconstruct part of its transmission system in this section and the erection of a new line to the plant of the West Point Cement Company, to cost about $39,000.

SAN DIEGO, CAL.—The San Diego Consolidated Gas & Electric Company has petitioned the Federal Power Commission for a license to erect a transmission line between Escondidi and Rincon, a distance of 15 miles.

STOCKTON, CAL.—The City Council is considering calling an election to vote on the proposal to issue $346,000 in bonds to install a fire-alarm system and equipment.

BOISE, IDAHO.—The Idaho Power Company has petitioned the Federal Power Commission for a license to erect an 8-mile transmission line in Baker and Malheur Counties, Oregon.

MACKAY, IDAHO.—Application has been made by J. E. Walker, Mackay, to the Federal Power Commission for a preliminary permit to build a 10-ft. diversion dam and power house on Big Boulder Creek, near Mackay and Challis.

SELIGMAN, ARIZ.—J. L. Vermeersch, Seligman, and associates have made application to the Board of County Supervisors for permission to construct and operate a light and power system in this section.

TUCSON, ARIZ.—The Tucson Gas, Electric Light & Power Company contemplates the erection of a transmission line to the mining properties of the Arizona-Tucson Copper Company, in the Palo Verde district, about 10 miles.

BIG FORK, MONT. — The Mountain States Power Company is arranging to install a 175-kw. generator and auxiliary equipment to cost about $100,000.

BUTTE, MONT. — The Montana Power Company has filed application with the Federal Power Commission for a license to build 12 miles of transmission line in Granite County.

CUT BANK, MONT. — The Cut Bank Electric Light & Power Company plans to install within the next ninety days a 50-kw. oil-engine-driven unit and a 30-hp. motor directly connected to a centrifugal pump. Frank H. Deal is secretary and manager.

WHITETAIL, MONT.—R. E. Marriage, owner of the local electric plant, contemplates installing a larger engine and making some line extensions.

PUEBLO, COL. — Arrangements have been made by the Southern Colorado Power Company for the erection of a 13,000-volt transmission line from La Junta to Las Animas to enable it to supply electricity to the Western Public Service Company.

BUCKHORN, N. M. — J. E. Walker, Buckhorn, has applied to the Federal Power Commission for a preliminary permit for a power project on the Gila River in Hidalgo and Grant Counties, to develop 30,000 hp.

Miscellaneous

SAN JUAN, P. R.—The Porto Rico Railway, Light & Power Company has appropriated $100,000 for its 1924 construction program, to cover the following work: (a) Remodeling of the electrical bussing, installation of oil switches and additional transformer capacity at hydro-electric plant No. 1; (b) installation of oxide-film lightning arresters at hydro-electric plants Nos. 1 and 2; (c) remodeling of the electrical features and installation of oxide-film arresters at the main substation at Santurce; (d) extension of the 21,000-volt transmission system from Caguas to Humacao, a distance of 20 miles. Work is already under way and a large portion of the material has been ordered. The company is also considering increasing the capacity of the plant by 5,000 kw.

Electrical Patents

Announced by U. S. Patent Office

(Issued May 6, 1924)

1,492,868. TELEPHONE SYSTEM; J. F. Toomey, New York, N. Y. App. filed Dec. 17, 1920. In which trunk lines are employed for connecting different switchboards or operators' positions.

1,492,913. ELECTRICAL INDICATOR MOTOR; F. W. Wood, Montclair, N. J. App. filed May 6, 1921. Adapted to be moved step by step to assume successive positions.

1,492,919. TELEPHONIC TRANSMITTER; M. R. Hutchison, Llewellyn Park, Orange, N. J. App. filed April 10, 1919.

1,492,931. COMMUTATING ELECTRIC MACHINE; K. Nobuhara, Hyogo-Ken, Japan. App. filed July 26, 1922. Comprising an annular chamber surrounding a part of the surface of a commutator and means for cooling with an insulating liquid.

1,492,972. DYNAMO-ELECTRIC MACHINERY; R. A. Engler, Chicago, Ill. App. filed Dec. 5, 1911. In which any given armature conductor always remains in a field of the same polarity and cuts the lines of force of that field.

1,492,991. PROCESS OF ELECTRIC WELDING; L. S. Lachman, New York, N. Y. App. filed Feb. 18, 1922. For welding two pieces or plates of metal together at their opposed surfaces.

1,492,992. COMPOSITE METAL WORK AND METHOD OF MAKING SAME; M. Lachman, L. S. Lachman and E. Fulda, New York, N. Y. App. filed Feb. 18, 1922. Electrically welded.

1,492,995. TELEPHONE SYSTEM; F. Lubberger, Schmargendorf, Germany. App. filed June 5, 1923. Machine switching in which separate speaking and setting routes are used.

1,493,003. DUPLEX PUSH-TYPE FLUSH RECEPTACLE FOR ELECTRIC INSTALLATION; A. C. Recker, Oakville, and H. C. Cady, Waterbury, Conn. App. filed Nov. 5, 1920.

1,493,008. CIGAR-LIGHTER IGNITER; W. P. Thomas, Detroit, Mich. App. filed May 17, 1923.

1,493,014. ELECTRICAL PERFORATOR; J. J. Boyle, Philadelphia, Pa. App. filed May 17, 1922. For check protection.

1,493,021. ELECTRIC TOASTER; E. A. Christoph, Chicago, Ill. App. filed Sept. 28, 1921.

1,493,024. RADIO SIGNALING; L. Cohen and J. O. Mauborgne, Washington, D. C. App. filed Aug. 6, 1920. Electrostatic disturbances and other interferences eliminated.

1,493,033. METHOD AND MEANS FOR AUTOMATICALLY REGULATING THE RESISTANCE OF A MAGNETO SAFETY GAP; D. Gregg, Dayton, Ohio. App. filed Oct. 7, 1922.

1,493,039. PROCESS FOR THE MANUFACTURE OF METALS OR ALLOYS POOR IN CARBON AND SILICON; B. M. S. Kalling and S. D. Danieli, Trollhattan, Sweden. App. filed Feb. 1, 1922. In an electric furnace.

1,493,042, 1,493,043. PREPARING OF METAL PLATES FOR WELDING; L. S. Lachman, M. Lachman and E. Fulda, New York, N. Y. App. filed Feb. 18, 1922. Wherein they are fastened face to face by a spot weld or welds on their opposed surfaces.

1,493,050. INDICATING DEVICE FOR MOTOR VEHICLES; E. W. Newell, Pittsburgh, Pa. App. filed Jan. 10, 1920. For signaling when the vehicle is about to stop or change direction.

1,493,052. DYNAMO-ELECTRIC MACHINE; W. D. Pennington and J. R. Pennington, Chicago, Ill. App. filed April 27, 1918. With a secondary circuit of relatively high resistance subjected to the counter flux set up in the motor windings, whereby the counter-emf. may be dispelled without creating high temperature or other undesirable results.

1,493,054. BALL AND SOCKET INSULATOR CONNECTION; L. Steinberger, Brooklyn, N. Y. App. filed Feb. 14, 1919.

1,493,070. ELECTRICAL IGNITION FOR SMUDGE POTS; J. M. Evans, Ceres, and H. McKinley, Modesto, Cal. App. filed April 17, 1922.

1,493,101. IGNITION VOLTAGE CONTROL FOR INTERNAL-COMBUSTION ENGINES; J. B. Bushnell, Berkeley, Cal. App. filed Aug. 15, 1921.

1,493,109. TELEPHONE SYSTEM; J. Davidson, Jr., Trenton, N. J. App. filed Aug. 10, 1920. In which the signals for a plurality of trunk lines extending between widely separated offices are controlled over a single signaling path common to such trunk lines.

1,493,139. SYSTEM OF CONNECTING BOOSTING TRANSFORMERS; W. Zederbohm, Berlin-Charlottenburg, Germany. App. filed May 18, 1921.

1,493,148. FUSE FOR VACUUM BULBS: M. B. Cohen, Boston, Mass. App. filed July 23, 1920.

1,493,151. WIRELESS DUPLEX SIGNALING SYSTEM; M. M. Dolmage, Washington, D. C. App. filed Sept. 17, 1920.

1,493,158. HEATING APPARATUS; F. W. Miller, Chicago, Ill. App. filed Feb. 19, 1921. Combined with a fan to distribute heated air.

1,493,184. INDUCTION MOTOR; E. C. Ballman, St. Louis, Mo. App. filed Jan. 19, 1920. Means for short-circuiting the commutator.

1,493,205. CLEANING OF METALS BY ELECTROLYSIS; I. Jascowitz and J. Rosenbaum, London, England. App. filed May 4, 1921.

1,493,216. VACUUM-TUBE FILAMENT AND PLATE COMPENSATION; R. C. Mathes, New York, N. Y. App. filed Feb. 17, 1919.

1,493,217. VACUUM-TUBE CIRCUITS; R. C. Mathes, New York, N. Y. App. filed Oct. 23, 1916. For securing a desired difference of potential between the filament and the grid of a vacuum tube.

1,493,254. AUTOMATIC TELEPHONE SYSTEM; J. Erickson, Chicago, Ill. App. filed Oct. 21, 1918.

1,493,259. ALTERNATING-CURRENT OSCILLATING MOTOR; H. V. Green, Chicago, Ill. App. filed July 22, 1922.

1,493,262. ELECTRICAL INSULATOR AND METHOD OF ELECTRICAL INSULATION; J. H. Hammond, Jr., Gloucester, Mass. App. filed Aug. 12, 1916. Insulating an antenna upon a submarine vessel.

1,493,279. ELECTRIC CLOCK; C. E. Prince, Burchetts Green, England. App. filed Sept. 5, 1923. With the pendulum mechanically separated from the clockwork.

1,493,284. TROLLEY HARP AND SHOE; H. Savage, Detroit, Mich. App. filed Jan. 19, 1924.

1,493,296. METHOD AND APPARATUS FOR LINE PROTECTION; H. Trencham, Belsaye, Ruislip, England. App. filed Nov. 8, 1920. To cut out automatically the faulty feeders or sections of the system.

1,493,302. SELF-STARTING SYNCHRONOUS MOTOR; H. E. Warren, Ashland, Mass. App. filed April 8, 1920. Adapted to operate a clock.

1,493,340. DEVICE FOR CONVERTING A CONTINUOUS FLOW OF ENERGY INTO A WAVE-LIKE FLOW OF ENERGY; W. Hahnemann, Kitzeberg, near Kiel, and A. du Bois-Reymond (deceased) late of Plon, near Kiel, Germany. App. filed April 6, 1923.

1,493,356. TELEPHONE INDICATOR; J. N. Littlejohn and S. M. Gault, Gaffney, S. C. App. filed Oct. 31, 1921. To indicate that a call was made during the absence of the called party.

1,493,358. TRAFFIC SIGNAL; T. E. McGlincy, Swedesboro, N. J. App. filed Aug. 29, 1922. For automobiles.

1,493,373. COMBINED CRUCIBLE AND POURING DEVICE; N. E. Morgan, Atlanta, Ga. App. filed Oct. 12, 1920. For use in the melting and pouring of metal, such as gold, silver and metals of like character which are used in the manufacture of dental appliances.

1,493,386. ELECTRIC GRID; A. S. Rice, New York, N. Y. App. filed April 18, 1923.

1,493,402. COMMUTATOR BRUSH; J. W. Strawbridge, Williamsport, Pa. App. filed Sept. 16, 1922. Mounted in a stationary manner upon a holder which is movable and spring-pressed to hold the brush in engagement with the commutator.

1,493,415. MICROPHONE; O. Angelini, Rome, Italy. App. filed Dec. 31, 1919.

1,493,435. DRY-CELL BATTERY; H. M. Koretzky and B. H. Teitelbaum, New York, N. Y. App. filed March 2, 1920. In which the active agents are kept separated preliminary to the time the battery is to be put into use to prevent deterioration of the elements.

1,493,440. PORTABLE ARC-WELDING APPARATUS; R. Stresau, Wauwatosa, Wis. App. filed Nov. 20, 1920.

1,493,450. SALINE HEATING APPARATUS; E. Richardson, Oklahoma City, Okla. App. filed May 5, 1923. For giving hypodermoclysis and proctolysis.

(Issued May 13, 1924)

1,493,468. SIGNALING DEVICE FOR AUTOMOBILES; C. C. Camp, Peoria, Ill. App. filed Aug. 29, 1921. Of the semaphore type.

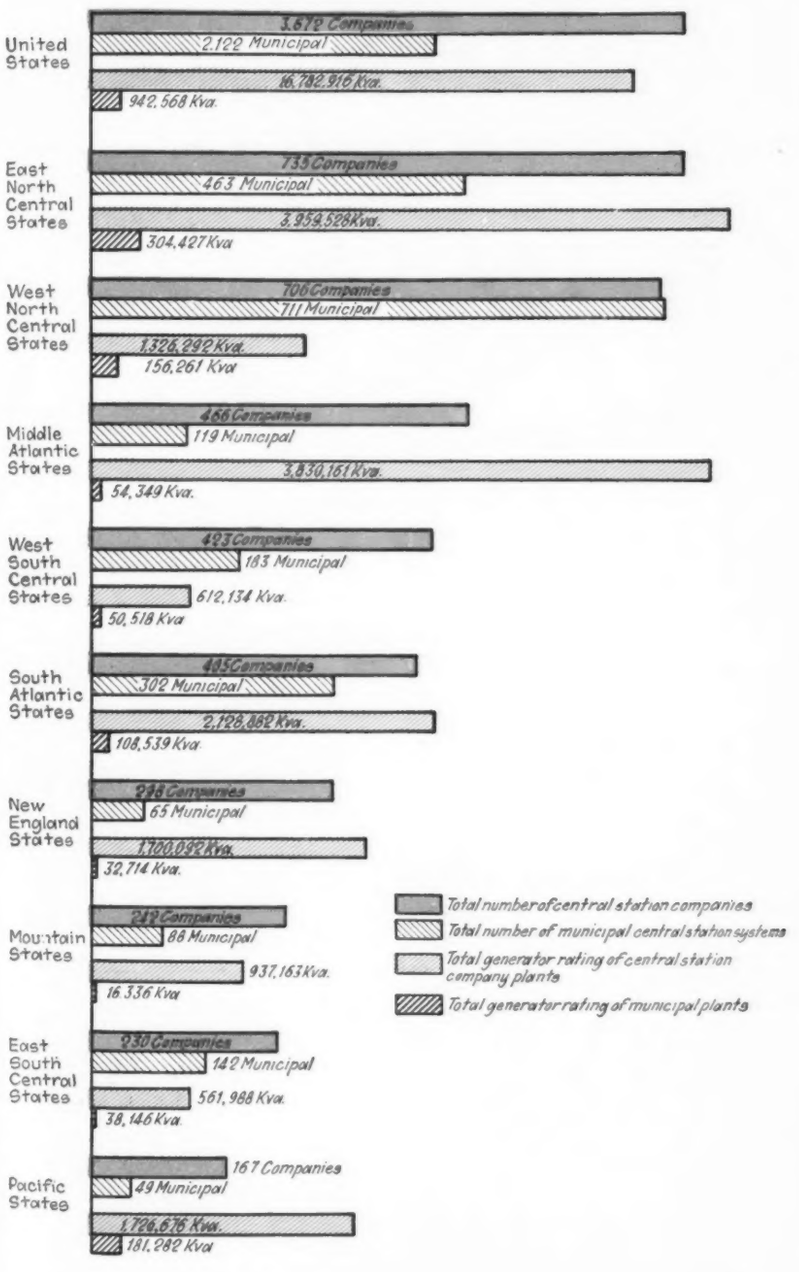
1,493,517. TELEPHONE CLIP AND HANDLE; H. B. Bush, Redlands, Cal. App. filed March 5, 1919. For attaching the terminal wires of a portable telephone set temporarily to the branches of a telephone line.

1,493,529. ARC-WELDING MACHINE; F. S. Greene, Cleveland, Ohio. App. filed Feb. 21, 1921. Automatic type.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

Total Rating of Generators in Municipal Plants Is Only 5.3 per Cent of the Total Generator Rating of the Country



Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote or use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who use these statistics would give credit to the ELECTRICAL WORLD.

Figures Sometimes Deceive

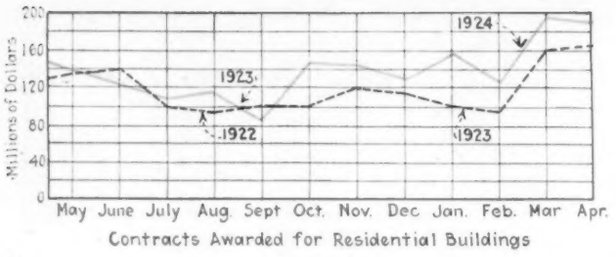
SOME wise man once said that figures do lie, that what seemed large was often really small, and that a semblance of power was, when fully investigated, sometimes found to be merely the strength of the weakling. China with her hundreds of millions, should, in so far as numbers are concerned, dominate the rest of the world with her potential man power, but China has been the football of nations for generations.

To state that of the 5,794 central-station systems at present operating in the country 36.7 per cent, or 2,122, are operated by municipalities would give the impression to the uninitiated that publicly operated systems are an element of considerable power in the electric light and power industry. But figures deceive — sometimes — even if they do not lie. It is not the number of generating and distributing systems that is of greatest significance, but the energy supplied by these systems, their rating in generator equipment, type of load and investment behind the system. The figure of 36.7 per cent takes on a very different aspect when it is found that these 2,122 municipal systems can account for only 5.3 per cent of the generator rating of the industry. Moreover, by reason of the fact that the majority of municipal systems, carry principally a lighting load with its poor load factor and have not developed much industrial motor and heating load, only about 3 per cent of the central-station energy consumed in the country is generated in municipal plants.

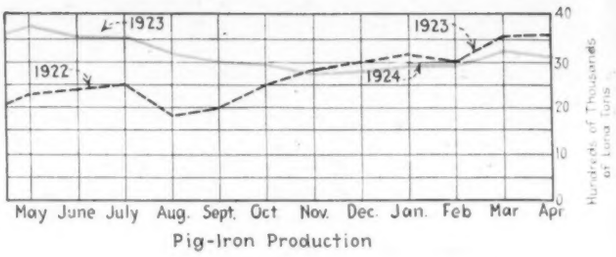
In the states in the western part of the Mississippi Valley municipal systems are most numerous. Each has had its genesis, in the main, because the municipality was so small it could not support a plant from electric revenues alone and it has deliberately undertaken to give partial support by taxation—or the "light" plant has been a small adjunct to a waterworks system. In virtually no cases are such plants real business enterprises. Thus even in the section of the country where they are most numerous, and notwithstanding the fact that there are a few more municipal than private systems, the rating of the municipal plants is only about 10 per cent of the total central-station generator rating of that section.

Truly do figures on any subject require careful study before their acceptance on their face value as affording a correct picture of the actual situation.

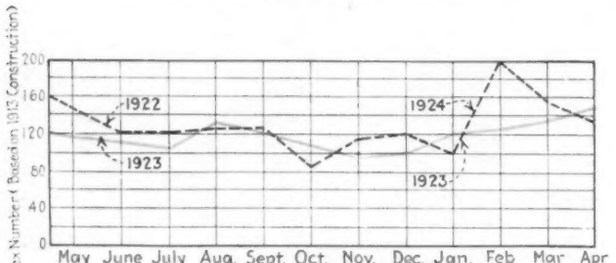
How the Primary Industries Are Trending



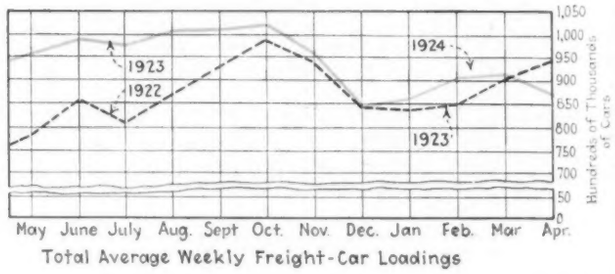
Contracts Awarded for Residential Buildings



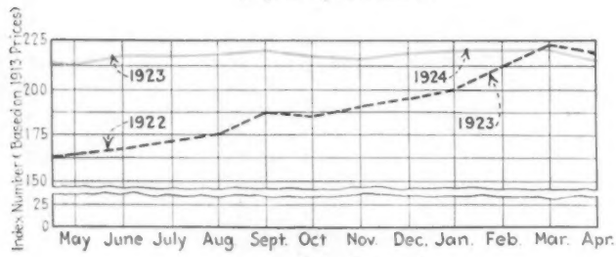
Pig-Iron Production



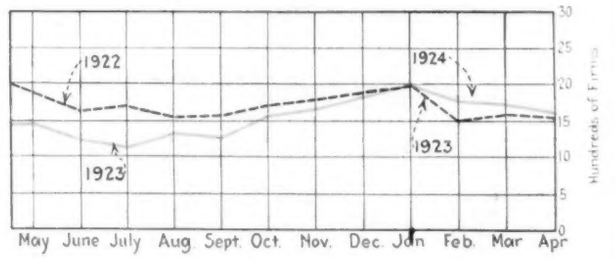
Construction Volumne Index
(Engineering-News Record)



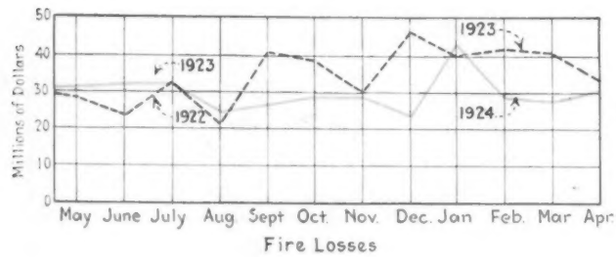
Total Average Weekly Freight-Car Loadings



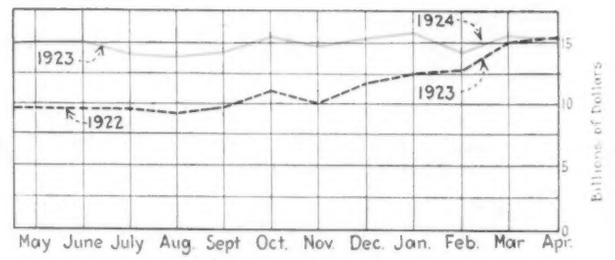
Construction Cost Index
(Engineering-News Record)



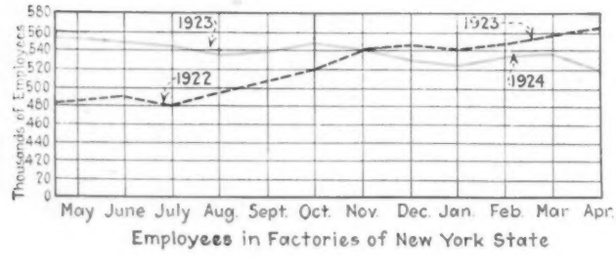
Business Failures



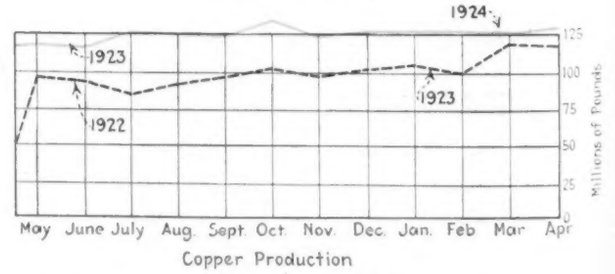
Fire Losses



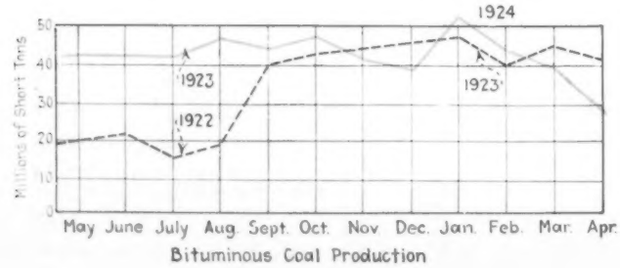
Bank Clearings
(Outside of New York City)



Employees in Factories of New York State



Copper Production



Bituminous Coal Production

Electrical Industry Rises Above General Economic Conditions

THE often-stated fact that the electrical industry as a whole rises above the economic disturbances of the country to a greater degree than with any other primary industry is borne out by present conditions. Business and industry in general are on the lower lobe of the business cycle, but the sentiment freely expressed by the electrical industry at the Atlantic City convention was that while industrial lines have suffered, other lines of electrical endeavor are very active.